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ARCHAEOLOGICAL SURVEY
OF CANADA
PAPER No. 37

COMMISSION ARCHÉOLOGIQUE
DU CANADA
DOSSIER No. 37

A DIAMOND JENNESS
MEMORIAL VOLUME

VOLUME COMMÉMORATIF
DIAMOND JENNESS

AN INTRODUCTION TO THE ECOLOGY OF EARLY
HISTORIC COMMUNAL BISON HUNTING AMONG
THE NORTHERN PLAINS INDIANS

GEORGE W. ARTHUR

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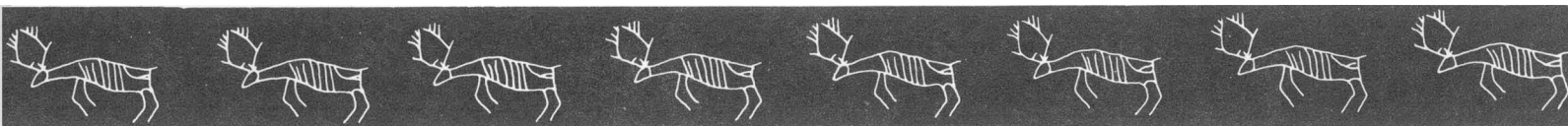
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ARCHAEOLOGICAL SURVEY
OF CANADA

PAPER No. 37

ISSN 0316-1854

COMMISSION ARCHÉOLOGIQUE
DU CANADA

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ISSN 0317-2244

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MUSÉES NATIONAUX DU CANADA

OTTAWA 1975

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DIAMOND JENNESS 1886-1969

A very modest man, a scholar and a gentleman quiet-spoken and self-effacing: that was the outward expression of a man of intellectual brilliance, physical courage and sharp wit who had a strong influence on anthropological studies in Canada and beyond--Diamond Jenness.

Canada's most distinguished anthropologist was born in New Zealand, graduated at Oxford, did his first ethnographic field work in the Pacific Islands, and then joined the Canadian Arctic Expedition in 1913 for three years in the Arctic. After overseas war service he became chief of the Anthropology Division of the National Museum. Besides proving himself a great eskimologist, Dr. Jenness conducted field work among various Indian Peoples, did archaeological work in Newfoundland and Alaska and wrote many books and papers. His book "The Indians of Canada" published in 1932 is still the

Un homme très modeste, un savant et un gentleman modéré et discret, voilà ce qu'on pouvait percevoir de cet homme d'une intelligence brillante, à l'esprit vif, d'une résistance physique et d'un courage à toute épreuve qui, au surplus, a eu une influence déterminante sur les études anthropologiques poursuivies au Canada et à l'étranger; voilà, en quelques mots, ce que fut Diamond Jenness.

L'anthropologue le plus éminent du Canada naquit en Nouvelle-Zélande et était diplômé d'Oxford. Il effectua ses premiers travaux d'ethnographie sur le terrain dans les îles du Pacifique et se joignit par la suite à l'Expédition canadienne de l'Arctique en 1913, et passa les trois années suivantes dans les régions polaires boréales. Après avoir servi outre-mer durant la guerre, il devint Chef de la division d'Anthropologie du Musée national. Spécialiste des cultures esquimaudes, Jenness fit aussi des recherches sur le terrain au sein de nombreuses populations indiennes.

classic statement on Canadian ethnology and his volumes on Eskimo administration are masterly studies which a scientist made absorbing to the layman.

The portrait above, painted by Robert Hyndman, was presented to Diamond Jenness on his 80th birthday in 1966 by friends and colleagues who held him in high esteem.

nes et se livra à des travaux d'archéologie à Terre-Neuve et en Alaska. Il est l'auteur d'un grand nombre d'articles et d'ouvrages dont "The Indians of Canada", édité en 1932, qui demeure une oeuvre classique de l'ethnologie canadienne. Ses écrits sur la gestion des affaires esquimaudes sont des études savantes que leur auteur a su rendre passionnantes même pour le lecteur non averti.

Le portrait ci-dessus, oeuvre de Robert Hyndman, fut offert à Diamond Jenness en 1966, à l'occasion de son 80^e anniversaire de naissance, par un groupe d'amis et de collègues qui le tenaient en haute estime.

CARIBOU BORDER MOTIF

A Dorset culture motif was thought appropriate to this series since Diamond Jenness first named and defined this culture in 1925. Two dimensional designs appropriate to a repeat motif are rare in Dorset collections. It was therefore a stroke of good luck that Father G. M. Rousselière, an Arctic archaeologist on contract with the Archaeological Survey of Canada, National Museum of Man, appeared at the appropriate moment with the example illustrated. The find, a portion of a composite bone box, discovered by a young Inuit girl, Martina Nubviak, at Hall Beach, is assigned to Late Dorset with a date about A.D. 1000.

BORDURE A MOTIF DE CARIBOU

Nous avons cru qu'il conviendrait d'identifier la présente collection par un motif décoratif propre à la culture de Dorset, puisque Diamond Jenness a été le premier à nommer et décrire cette culture en 1925. Les décorations bidimensionnelles se prêtant à un motif répétitif sont rares parmi les collections de Dorset. Il convient donc de se réjouir de ce que le Père G. M. Rousselière, archéologue de l'Arctique, et collaborateur à forfait de la Commission archéologique du Canada, Musée national de l'Homme, ait fait surgir à point nommé le dessin reproduit. Il s'agit d'une portion de la décoration d'un aiguillier en os, découvert par une jeune fille inuit, Martina Nubciak, à Hall Beach, et attribué au Dorset récent, vers l'an 1000 de notre ère.

THE UNIVERSITY OF CALGARY

AN INTRODUCTION TO THE ECOLOGY OF EARLY
HISTORIC COMMUNAL BISON HUNTING AMONG
THE NORTHERN PLAINS INDIANS

by

GEORGE W. ARTHUR

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF ARCHAEOLOGY

CALGARY, ALBERTA

APRIL 22, 1974

GEORGE W. ARTHUR © 1974

ABSTRACT

For the early historic period (A.D. 1750-1880) on the northern Plains, ethno-historians and anthropologists have constructed what appears to be a sensible reconstruction of the annual hunting cycle of the northern Plains tribes.

Presented briefly, the tribes dependent primarily on the bison, the Assiniboiné, Blackfoot, Cree, and Gros Ventre, formed large camps only in summer when large bison herds formed during the rutting season. After the rut, the bison scattered into smaller herds during the fall as they moved onto their winter range. This necessitated a breakup of the Indians into small groups of ten to thirty lodges during the fall and winter months. During the fall into December, the bison jumps and pounds were utilized to secure sufficient provisions to permit these small groups to remain in their winter camps until spring.

Examination of this reconstruction has led to a significantly different result than has been previously accepted. Analysis of early historical documents demonstrates that:

(1) Bison jumps and pounds were used by these tribes in fall and throughout the winter.

(2) The northern Plains tribes stored up dried provisions throughout the winter for use when supplies of fresh meat were gone. However, the bison drives were used throughout the winter and the production of large quantities of dried provisions in early fall

for winter use was not undertaken and was not necessary in early historic times.

3. In early fall, the bison moved onto their winter range where they tended to form larger, sedentary herds, although small herds were scattered over the range. These larger sedentary herds permitted the formation nearby of large Indian encampments of 1,000 - 2,000 people which exploited these herds during the fall and winter months using the traditional bison drives.

RESUME

Les ethnohistoriens et les anthropologues ont tenté de reconstituer, pour la période historique ancienne (1750-1880 apprr. J.-C.), le cycle annuel de chasse des tribus des Plaines du Nord.

En résumé, les tribus qui dépendaient surtout du bison pour leur subsistance, les Assiniboines, les Pieds-Noirs, les Cris et les Gros-Ventres, ne formaient de grands camps qu'en été, lorsque de gros troupeaux de bisons se constituaient pendant le rut. Après cette période, c'est-à-dire en automne, les bisons se séparaient en petits groupes pour gagner leur habitat d'hiver. Les Indiens devaient donc se diviser en petits groupes de dix à trente maisons pendant l'automne et l'hiver. A partir de l'automne jusqu'à décembre, les précipices et enclos à bisons servaient à procurer à ces petits groupes d'Indiens des vivres en quantité

suffisante pour leur permettre de passer l'hiver dans leurs camps.

L'examen de cette reconstitution a permis d'en arriver à des conclusions passablement différentes de celles déjà reconnues. L'analyse des documents historiques anciens montre que:

(1) Ces tribus se servaient des précipices et des enclos à bisons en automne et en hiver.

(2) Les tribus des Plaines du Nord constituaient des réserves d'aliments séchés pendant l'hiver pour les périodes où la viande fraîche manquerait. Cependant, les battues de gibier continuaient tout l'hiver et il n'était pas nécessaire, à cette époque, de constituer de grandes réserves d'aliments séchés pendant l'automne en prévision de l'hiver.

(3) Au début de l'automne, les bisons gagnaient leur habitat d'hiver, où ils formaient généralement de grands troupeaux sédentaires, mais on en trouvait de petits groupes dispersés dans les plaines. Ces grands troupeaux sédentaires attiraient les Indiens, qui formaient à proximité d'importants camps de 1,000 à 2,000 personnes; ceux-ci assuraient leur subsistance, en automne et en hiver, en organisant des battues à la manière traditionnelle.

ACKNOWLEDGEMENTS

The author wishes to thank the members of his thesis committee for their many valuable suggestions and criticisms. Special thanks are due Dr. Richard G. Forbis, the thesis supervisor and committee chairman, for his excellent criticisms and timely encouragements. Thomas F. Kehoe of the Milwaukee Museum provided information on historical documents and other sources. Among many other friends who offered valuable criticisms and advice, those who contributed time and effort in the latter stages of its completion are Dr. Fraser Sutherland, who unravelled grammatical problems, Miss Joan Rossler who typed it, Biron Ebell, Robert Hersche, and Danny Maddigan who proofed the final copy. Last, I would like to thank my wife and children for their thoughtfulness and their understanding that made this possible.

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CHAPTER I

INTRODUCTION

This study focuses on specific tribes of Indians that inhabited the northern Plains in early historic times. These include the Blackfoot (Piegan, Blood, and North Blackfoot), Gros Ventre (Atsina), Plains Cree, and Assiniboiné.

The geographic area inhabited by these tribes is the northern Great Plains which includes the grassland portions of the Canadian Prairie Provinces east of the Rocky Mountains and south of the aspen parkland fringe, as well as that portion of Montana east of the continental divide and the present state of North Dakota. As defined by Hoffman and Jones (1970:357-359), this area at present consists of four major biomes: (1) grassland, or steppe; (2) deciduous forest; (3) coniferous forest; and (4) alpine forest (see Figure 1).

The tribes of this area were last on the Plains to obtain horses. This occurred between 1725 and 1740 A.D. (Ewers 1955:332). Horses were acquired by trade or theft from other tribes to the south and southwest. Although the Piegan, Blood, and Gros Ventre had many horses, the Plains Cree, Assiniboiné, and North Blackfoot, on the other hand, were generally poor in horses throughout the early historic period. Retention of their traditional communal bison drives has been attributed to this fact. Because of the late acquisition of the horse, the early historic accounts of the use of

the traditional hunting methods began early enough to show little, if any, change from the pre-horse methods or the season when they were used.

The accounts began with Henry Kelsey's visit to the Carrot River prairies of Saskatchewan in 1691-2, followed by Anthony Hendry's journal of his trip across the prairies in 1754-5. From that time, the Hudson's Bay Company records grew into a large reservoir of impressions, descriptions, values and attitudes of the traders, concerning the Indians, flora, fauna, and Plains.

Excluded from this study are the Indians to the south, among them farming tribes, who acquired the horse earlier than the tribes focused on in this study and long before the arrival of the trappers and traders. Information at hand on these tribes has been used where pertinent.

The annual cycle of northern Plains Indian life has been the subject of historical and culture-historical inquiry for many years. Early ethnographic studies included those of Grinnell (1892) and Wissler (1910) on the Blackfoot, Kroeber (1908), the Gros Ventre, and Lowie (1910), the Assiniboine, and later the Crow. While Kroeber drifted off into other interests, Grinnell, Wissler, and Lowie maintained a strong life-long interest in Plains Indian culture. In this same scholarly tradition has followed the work of Ewers (1949, 1955, 1968), and Schaeffer (1962) on the Blackfoot, Mandelbaum (1940) on the Plains Cree, Rodnick (1938) on the Assiniboine, and Flannery (1953) on the Gros Ventre.

Synthetic studies of Plains Indian culture that focused on historical problems include the work of Mishkin (1940), Lewis (1942),



Figure 1; Map of the Northern Plains

Jablow (1950), and Secoy (1953).

In 1962, a significant and pioneer study of cultural ecology of Plains Indians by Symmes C. Oliver was published. This was the first attempt to relate the annual cycle of both the buffalo hunters and the bison to explain continuity and change in Plains Indian social organization.

Archaeologists have confirmed an antiquity for northern Plains hunting cultures of well over 10,000 years, and have produced an equally long chronological record of culture change. Among the early studies were those of Montgomery (1906 & 1908), Will (1924), and later, Mulloy (1958), Forbis (1960), Kehoe (1967), Arthur (1962), Davis and Stallcop (1965 & 1966), and Frison (1967). Although archaeologists have drawn heavily from other disciplines such as biology, geology, chemistry, and physics, for analysis of excavated material, their cultural analogies have been largely dependent on the reconstructions of the ethno-historians.

The work of ethno-historians has been complicated by a number of factors. The comings and goings of numerous fur traders, trappers, naturalists, military men, and others, produced a written reservoir of varied and often conflicting observations about the Plains and its inhabitants. These observations were both eye-witness and second hand, and consisted of brief mention to detailed accounts. Familiarity with the Plains ranged from the tenderfoots short acquaintance to that of the seasoned "old timer" who had spent a lifetime there. Also, new accounts were added to the reservoir, and this added to the difficulties of making sense out of all the material. Moreover,

the ethno-historian's work has been complicated by culture change that began with the introduction of the horse and gun to the Plains. European culture gradually became dominant as the bison began to decrease and as the Indians became more and more dependent on European trade goods, and came under the influence of European ideas and values.

Despite these problems, the ethno-historians have presented what has become accepted as a sensible reconstruction of the annual cycle of the Plains Indians. This reconstruction follows and is presented briefly. The buffalo hunting tribes, dependent on the bison, gathered together in summer in large groups around the time of the bison rutting season when the bison were also in large herds. This permitted the Indians to gather for the Sun Dance and also for protection against enemy war parties. After the rutting season, the bison began to scatter into smaller herds during the fall as they moved into their wintering grounds. This necessitated a breakup of the Indians into small groups of ten to thirty lodges during the fall and winter months. During the fall into December, the bison jumps and pounds were utilized to secure sufficient provisions to permit these groups to remain in their winter camps until spring. During the winter, there was less danger from enemy tribes and they continued to live in small groups to exploit the scattered herds of bison. To secure fresh meat in January and February and sometimes March, occasional hunting forays were made by individuals or small parties. These were usually on foot or snowshoes, but sometimes on horseback. As spring began, the Indians scattered in search of the bison herds which they remained near throughout the spring and summer.

There seems to be little doubt that the annual life cycle of those northern Plains tribes who were bison dependent was closely interwoven with the annual cycle of the bison. However, the Indians annual cycle as gleaned from the historical accounts has been vastly oversimplified in the ethno-historians reconstruction of that cycle. Furthermore, the historical accounts and modern studies of bison behaviour indicate that the annual cycle of the free roaming bison was different and more complicated than the ethno-historical reconstructions have described. If we are to maintain the basic premise of the Plains Indian's strong dependence on the bison, must not the annual cycle of the Indians be closely related to that of the bison?

Therefore, it is my purpose to examine the ethno-historical reconstruction of the hunting activities of the northern Plains tribes (Blackfoot, Plains Cree, Gros Ventre, and Assiniboine) in relationship to the annual cycle of the bison in the plains-prairie grassland.

Theoretically, this study emanates from certain anthropological assumptions:

(1) Culture is the means by which man adapts to his environment.

(2) Cultural adaptation is adaptation to other individuals, groups and cultures as well as to other ecological variables of the environment.

(3) Cultural adaptation to a given set of ecological variables (culture change) is the product of technology, social organization, and ideology of the adapting culture.

(4) Culture change follows evolutionary principles and regularities from which cultural process (the causes of change) may be empirically demonstrated and explained.

Operating from these assumptions, the hypothesis of this dissertation is stated as follows:

The annual cycle of the bison dependent northern Plains tribes as reconstructed and described by Ewers (1955), Oliver (1962), and Frison (1967, 1970b, 1971, 1973), among others, and which is accepted by Plains anthropologists, does not coincide with early historical, documented evidence of Indian behaviour and bison behaviour, nor with modern evidence on bison behaviour and other ecological variables.

Therefore, to analyze the evidence, I have posed three questions as follows:

(1) Among the northern Plains tribes, dependent year round on the bison, did the season of the bison drives begin in early fall and terminate in late fall or December?

(2) Was it necessary for the Blackfoot and other northern Plains tribes to store up sufficient provisions in fall to permit them to remain as inert as possible throughout the winter months until spring?

(3) In fall, after the rutting season, did the bison split up for the fall and winter months into small, scattered herds, thereby forcing the Indians to split into small groups to more effectively hunt the bison and exploit a usually harsh winter environment?

To answer these questions, I have utilized the early historical accounts, especially those of the fur traders. Archaeological information has been used for description and explanation of certain hunting methods and activities, as well as to reinforce ideas and arguments in the study. Evidence from modern range management studies of the effects of fire on the grassland may help to answer long unproven questions about grassland maintenance. Modern studies of bison behaviour have proved useful to clarify and explain certain questions about the bison during the so-called "drive", and also about the seasonal movements of bison, as well.

The following chapter introduces the variables used in this study (man, bison, fire, and grassland), and demonstrates the inter-relatedness of these factors and some effects of each on the others.

In Chapter III, the characteristics, behaviour, and seasonal movements of the bison are described and discussed. Information on bison was obtained from the historical documents, but where these early accounts conflicted or failed to provide information, modern studies of bison behaviour were used for clarification and supplementation of data. Presented is information on bison behaviour required for discussion and explanation of the hunting activities surrounding the use of bison drives, and also information that is necessary to understand the bison's annual cycle.

Chapter IV describes the traditional hunting methods of the northern Plains tribes and details the use of bison jumps and pounds. The factors of Indian, bison, fire, topography, and others are brought together to hopefully clarify some of the misconceptions

of the bison drive that are found in the anthropological literature.

Chapter V brings together the evidence from the previous three chapters into a discussion of the questions posed earlier in Chapter I. This is followed by a discussion and presentation of the annual cycle of both the northern Plains Indian and the bison in view of the evidence presented.

Chapter VI summarizes the study with the conclusions presented as hypotheses which may be tested by further research.

CHAPTER II

BISON, FIRE, AND MAN ON THE NORTHERN GREAT PLAINS

Wells (1970:198) has pointed out that there is a well-entrenched viewpoint that the distribution and maintenance of treeless grasslands in North America is governed principally by climate (Clements 1916; Borchert 1950). The principal adherent and spokesman of this view, Frederick E. Clements (Clements 1916; Clements & Clements 1933:203-205; Clements & Chaney 1936:31-35), narrowed the perception of grassland ecology by excluding animals, fire, and the Indians as significant factors in its distribution and maintenance. Furthermore, Clements maintained that the short grass Plains was an unnatural condition brought about by the coming of the white men and domesticated grazing animals. If the effects of these were removed, he held, the short grass Plains would return to its true or pristine condition which was a mixed grass prairie.

Although no serious ecologist would deny the importance of climate as a factor in Plains grassland ecology, serious criticism of the view held by Clements and his followers has been raised.

One of his most effective critics was Larson (1940:113-121), who contended that short grass cover was the natural condition of the northern Plains because the bison and other wild grazing animals, factors which helped maintain that condition, were themselves indigenous to the area and could not be excluded from its ecology.

Larson (1940:117) pointed out that heavy populations of wild animals continually overgrazing the Plains was well recorded in the historic documents. Furthermore, Larson contended, Clement's argument that the unnatural condition was caused by the overgrazing of domestic cattle was not valid because the census of 1900 showed that thirty million cattle, horses, and sheep were merely substitutions for the former wild grazing animals (Larson 1940:117). Short grass was the normal Plains condition, and of long standing, Larson (1940:119) added, because of the "marked ability of the short grass dominants to withstand heavy overgrazing, which indicates that this environmental factor is not strange or recent."

It is doubtful that anyone today can conjure up the sight, smell, sound, and feel of the Great Plains prior to the coming of the white men. A partial requirement would be to envision an estimated 30 to 60 million bison wandering and feeding over this vast grassland along with four to eight million antelope, and extensive herds of deer, elk, big horn sheep, wolves, cougars, bears, and other wild animals (Larson 1940:117; Gates 1965:114-116).

That the numbers of these animals was great may be inferred from the accounts of early travellers, traders, and explorers. Such references are particularly abundant concerning the vast herds and numbers of bison (Ewers 1955:148). Wintering with the Piegans in mid-February, 1793, Peter Fidler, the Hudsons' Bay Company trader, described the buffalo on the northeast side of the Red Deer River and near it as very numerous:

. . . from the N to S the ground is entirely covered by them and appears quite black. I never saw such amazing

numbers together before. I am sure there was some millions in sight as no ground could be seen for them in that complete semi-circle and extending at least 10 miles (MacGregor 1966:82).

MacGregor (1966:82) related that ten days later Fidler was still in the midst of vast herds crossing the river to the west. In October of 1793, John Macdonnell, a clerk of the Northwest Company, described "Incredible numbers of Buffaloes to be seen in all directions" near the junction of the Qu'Appelle and Assiniboine Rivers (Gates 1965:115). In Alberta, as late as the year 1865, John McDougall (1898:95) observed:

. . . more buffalo than I had ever dreamed of before. The woods and plains are full of them. During the afternoon we came to a large round plain, perhaps ten miles across, and as I sat my horse on the summit of a knoll looking over this plain, it did not seem possible to pack another buffalo into the space. The whole prairie was one dense mass.

Moving together with the bison herds were large number of antelope, deer, elk, and wolves. The predatory wolves culled the bison herds of the very young calves, the old, the weak, and the unwary.

Although the great abundance of bison was attested to by many other early travellers on the northern Plains including Anthony Hendry, Alexander Henry (the younger), Lewis and Clark, and David Thompson, those same travellers and others sometimes found themselves so out of touch with game for days at a time, that they suffered privation and hunger in the overgrazed areas.

That the bison were heavy grazers was noted by many early travellers. For example, Alexander Henry the younger (Henry & Thompson 1965:1:190), who wrote on January 10, 1802, that the hunters

were "running" buffalo (chasing them on horses) with which the Plains were covered, reported a month later on February 15, that the "Buffalo have destroyed all the grass and our horses are starving." On August 2, 1805, the Canadian trader, Francois Larocque, in the vicinity of the Big Horn Mountains of present-day Wyoming, reported that the grass had been "completely eaten by buffalo and elk" (Larocque 1910:32). Osborne Russell, the American trapper, found that on his arrival in the Powder River Valley on February 7, 1838, the buffalo had consumed all the grass along the river bottoms and his party was forced to feed their horses cottonwood bark (Russell 1955:81).

The wandering proclivities of the bison and other hoofed animals over the Plains produced other important effects in maintaining the grassland which are known from studies of the Russian steppes. Formosov (1928:449-460) and other Russian scientists, studying the grasslands of Eurasia, found that in ungrazed areas, excessive growth of the taller and bulkier plants suppressed the weaker plants. However, the hoofed animals native to the area (antelope, mountain sheep, and wild asses) grazed off the excess leafage, and by trampling, broke loose dead stalks, and so prepared the way for a new growth of grass. Grazing and trampling down of the grass reduced water losses through transpiration and evaporation during dry periods and so promoted the natural reseeding process. Many of the dominant native grasses of the Eurasian steppe were species of the same genera found on the Great Plains (Formosov 1928:460), where the hoofed animals such as deer, elk, antelope,

big horn sheep, and vast numbers of bison performed a similar maintenance function.

While the trampling of grasses is a function of all grazing animals, a modification of the environment specifically attributed to the bison was produced by an important grooming activity known as wallowing. It resulted in saucer-shaped declivities scattered over the rolling Plains. Wallowing, or rolling on one side and then the other on wet or dry ground, was not restricted by season and was common to all bison regardless of age or sex. The projected reasons for it are various. Wallowing may have been induced by insect irritation since most wallows were created during the summer months (Nelson 1965:5; Soper 1941:386). However, Mathew Cocking (1908:108) noted, as did McHugh (1958:5), that wallowing increased among bulls during the rut which also took place during the summer months. Another object of these peculiar ablutions apparently was to remain cool despite the summer heat. To this end, according to Allen (1876:65), a moist piece of ground was sought and, if found, shortly reduced to a muddy mass in which the bison wallowed "like a hog in the mire." An excavation was eventually made to a diameter of fifteen or twenty feet, and two feet in depth. Dry wallows, however, were smaller in size than mud wallows, usually only ten to twelve feet in diameter and up to one foot in depth (Allen 1876:65).

Wallows occurred on moderate slopes as well as on level ground (Nelson 1965:33; Soper 1941:385), and often densely covered many acres, destroying large areas of ground cover (Soper 1941:386). According to Soper (1941:385) and Nelson (1965:35) wallowing resulted

not only in the ground being stripped of all vegetation, but also, in the majority of cases, the top soil itself being completely removed. Such areas took years to recover. Occasionally, too, wallows located on hillsides contributed to erosion during rainstorms (Nelson 1965:35).

On the other hand, one of the noticeable beneficial effects of buffalo wallows to man and other animals noted by Grinnell (1970:273) was that they "often contain water after all other moisture, except of streams is dried up." According to Allen (1876:65-66):

Owing to the impervious nature of the clayey soil that generally characterizes the Plains, these hollows temporarily retain the water that collects in them during falls of rain, affording grateful supplies of this important element to the various animals of the region, as well as often to man, these pools usually lasting for several days, or until slowly evaporated by the sun.

Less well known than wallowing was the bison's habit of scratching himself against boulders and trees. Large glacial erratic boulders dotting the northern Plains were frequently rubbed smooth by bison. According to Grinnell (1970:273), the ground immediately around these boulders was often worn down two or three feet below the level of the surrounding prairie by animals walking about the boulder. Bison also horned and rubbed trees sufficiently to remove the bark, and this, as noted by McHugh (1958:5) occurred at all seasons. Smaller trees were undoubtedly broken or pushed over when we consider that the first telegraph poles, though small and light, were used as rubbing posts by the buffalo and also were pushed over (Grinnell 1970:273-274).

In a modern study of bison, Nelson (1965:35) reported that trees served not only as rubbing posts but "Occasionally, smaller

trees and bushes were broken or uprooted, possibly through becoming entangled in the horns." In addition to such breaking and uprooting, the reported tendency of bison to crowd into available groves of trees in winter during blizzards (Henry 1969:286), and in summer to escape from the heat and flies, undoubtedly led, through trampling, to the damage of roots, seedlings, and all plants. A similar destruction to the ground cover occurred when vast numbers of bison congregated together such as during the rut. However, the effects of rubbing, horning, uprooting and trampling of trees by bison on the Plains was doubtless an important factor in checking the invasion of prairie by aspen and other timber (Moss 1932:405-406; Roe 1970:105; Seton 1909:287), and hence, was an integral element in the maintenance of grassland ecology.

Another important effect of the bison was to mark the Plains with a vast network of well-worn trails, usually between the tablelands and watercourses. Trails of the buffalo result from their habit of following one another, usually a cow, in long, ever broadening files.

That these trails were considered the most feasible routes available has been extolled by many observers (Allen 1876:63; Bradbury 1904:99; Garretson 1938:57) and criticized by Roe (1970:119-124).

According to Allen (1876:60) and Grinnell (1904:137-138), the general course of streams on the Great Plains runs west to east and the buffalo trails intersect these streams from the north and south. This apparently contributed to a widespread belief

among many early hunters and plainsmen that the buffalo practiced very extended migrations north and south. Allen (1876:60) himself had been given assurances that the buffalo located in summer on the Plains of Saskatchewan spent the winter in Texas. However, a critical analysis of this supposition by Roe (1970:521-600) has discredited such long migrations in favour of shorter seasonal movements.

Both Soper (1941:387) and McHugh (1958:9) noted that the trails varied with the terrain over which they lead, and when one trail became deeply worn, new trails were started within several feet of the old one. Eventually, as many as a dozen or more lead on side by side through forest and prairie. McHugh (1958:37) observed that at times the buffalo wore down trails with surprising speed, and on one occasion when the ground was muddy, 265 buffalo passed over one trail cutting it one-half to two inches deeper and from twelve to fifteen inches wider on the single trip. On steep slopes, the deeply eroded trails:

. . . occasionally acted as drainage canals to lower the water table in uphill areas and thus eventually produce a change in vegetation. Trails cut near the top of steep, sandy hills initiated washing and slippage of sand to create barren areas (McHugh 1958:37).

The trails, however, were not the only cause of erosion due to the bison. Another cause reported by McHugh (1958:37) was that "Concentrations of buffalo on south-facing, wind-blown ridges in winter produced almost complete denudation of vegetation cover. Such areas then eroded badly." Similar erosion very likely occurred along the steep slopes of the river valleys throughout the northern

Plains in the days of the free-roaming bison.

On the other hand, one of the bison's most beneficial effects was to continually fertilize the Plains with dung. According to Soper (1941:389), the maintenance of the grassland was achieved in direct fashion by buffalo dung, and:

. . . anyone who has seen the great quantities of this material distributed in a single season, over plain and meadow, is impressed by the possibilities. This is well spread one season with another.

Although the fertilizing benefits of buffalo dung were most likely understood by early Plains travellers, the fate of the Indians and the westward course of empire depended on the "buffalo chip". As Allen (1876:201) cogently pointed out:

. . . the first meeting with buffalo chips . . . not only generally gives promise of soon meeting with herds of animals themselves, but insures fuel for the camp-fire and for culinary purposes in regions where other sources of fuel are either precarious or entirely wanting. In the history of travel across the great interior plains, from those of Texas to those of the Saskatchewan, no other element, not even water, figures more prominently.

The use of buffalo chips helped parties economize on the wood they often carried with them (Palliser 1863:43). According to Fidler (Johnson 1967:302), during cold weather buffalo dung was a poor substitute for wood, and Audubon (Audubon & Bachman 1851:46) noted that "In the winter this prairie fuel is often too wet to burn, and the hunters and Indians have to eat their meat raw."

The size of the buffalo chip is larger than that of domestic cattle and a large one often measured over three feet in diameter and could level off at a height of ten inches (McHugh 1958:36).

According to Allen (1876:201), despite the vicissitudes of

weather the decomposition of the buffalo chip is slow, remaining in a serviceable condition for years. After six months of exposure to the elements "It burns quite readily" but is at its best as a fuel after a year.

It burns in much the same manner as peat, and though making little flame yields a very intense heat. Strips of buffalo fat thrown on at intervals during the evening add a bright blaze . . . (Allen 1876:201).

Although the bison may have affected the Great Plains grass-land in infinitely subtle ways, one potential effect that might be considered somewhat unusual for bison was proffered by Soper (1941: 388-9).

There is no direct evidence that the bison is responsible for dissemination of plant life . . . That some types of seeds could be easily transported in the woolly pelage of bison, as in the case of range cattle, is a foregone conclusion . . .

A similar conclusion was drawn by Seton (1909:286) who noted that "spear grass" or "wild oats" (Stipa spartea) clung to the wool of the bison and by boring into the hide, caused an irritation that aggravated the bison to wallow. According to Seton, the evidence that bison spread wild oats in wallows may be observed in the fact "that the old wallows are rimmed about with an unusually thick and vigorous growth of spear-grass."

Admittedly, the wide range of animal species existing on the Plains affected the vegetation and soils extensively. Ecologically, this was an endemic process in which the bison occupied his niche, but along the way he provided the Indians with energy in the form of food and fuel, and most of the other necessities of life.

Although the historical accounts of early travellers on the Plains support the role of fire as important in both creating and

maintaining the grasslands, Clements (Clements & Chaney 1936:33-34) dismissed these accounts as "incidental" and "imperfect" and argued that "relatively small portions of the prairie were fired annually " Although Clements did not completely deny the importance of fire, his diminution of its importance was stated simply:

Though fire has frequently been invoked to explain the presence of prairies . . . it has much less significance than commonly supposed . . .

However, the historical documents as well as recent studies by soil biologists and range management specialists show that fire has much more significance in explaining the prairies than supposed by Clements.

The geographer, Carl Sauer (1956:55), took a position diametrically opposed to that of Clements by maintaining that the origin and preservation of the grasslands was due mainly to burning, and summed up the reasons for his position as follows:

The climatic origin of grasslands rests on a poorly founded hypothesis. In the first place, the individual great grasslands extend over long climatic gradients from wet to dry and grade on their driest margins into brush and scrub. Woody growth occurs in them where there are breaks in the general surface, as in the Cross Timbers of our Southwest. Woody plants establish themselves freely in grasslands if fire protection is given: the prairies and steppes are suited to the growth of trees and shrubs native to adjacent lands but may lack them. An individual grassland may extend over varied parent-materials. Their most common quality is that they are upland plains, having periods of dry weather long enough to dry out the surface of the ground, which accumulate a sufficient amount of burnable matter to feed and spread a fire. Their position and limits are determined by relief; nor do they extend into arid lands or those having a continuously wet ground surface. The inference is that origin and preservation of grasslands are due, in the main, to burning and that they are in fact great and, in some cases, ancient cultural features.

Wells (1970:199), in agreement with Sauer, maintained that despite variations in climate and the species composition of a specific locality or region, it was the immense continuity of tinder dry grass on the smooth plains topography that formerly favoured the vast wind driven grass fires. Only in the shelter of fire restricting escarpments and similar fire-breaks would mature trees be found.

It is clear that, despite the importance of climate in the origin and maintenance of the Plains, the role of fire and its significance to grassland ecology is only beginning to be understood.

The question of whether lightning ignited fires have been important in grassland ecology has long been argued. Many writers, among them Gleason (1913); Stewart (1956); and Clements and Chaney (1936) were unable to discover any record of grassland fires started by lightning. However, in a 1911 Kansas newspaper, Malin (1956:350) located two reports of lightning ignited prairie fires. Earlier, still, in a letter written in 1895, John Macoun wrote:

I may say that last season and in that of 1893 fires were caused by lightning setting fire to the grass. In one thunder storm last summer three fires were started at Crane Lake southern Saskatchewan by lightning striking the prairie (Raby 1966:99).

Nelson & England (1971:295) reported that Peter Fidler, while camped south of present-day Calgary, -on 18 December, 1792, noted in his journal that "lightning in the spring and fall frequently lights the Grass."

More recently, in southern Saskatchewan, Rowe (1969:317-324) obtained reports from ranchers of at least fifteen lightning created grassland fires. The testimony of the ranchers was corroborated by other observers, including the Royal Canadian Mounted Police,

soil surveyors and meteorologists. Most of the fires occurred between July and September 1967. Several of the ranchers were astonished to hear that the occurrence of lightning fires had been questioned. The threat to grazing land is recurrent and is most dangerous in years when a moist spring with lush growth is followed by summer drought (Rowe 1969:318).

The case for grassland fires of human origin, as an essential element in the origin and maintenance of plains and prairie has been stated very effectively by Sauer (1956:49-69) and Stewart (1951: 317-320), and perhaps overstated, to assure that the use and control of fire throughout human history was accorded its proper ecological significance and role.

On the northern Plains it is clear that the Indians were very knowledgeable about the use of fire and its effect on both the grassland and bison.

The Indians fired the prairies for many reasons, some of them very trivial according to Palliser (1863:57), such as signalling one another "concerning a successful horse stealing expedition, proclaiming the safe return of a war party," or as Hind (1971:336) related, "that they had found buffalo." M'Gillivray (1929:22) at Fort George in 1794, accused the Indians of firing the Plains to frighten the bison away in order to "enhance the value of their own provisions" that were sold to the fort.

The use of fire among Indian tribes in hunting is well known on the Plains, particularly in the northeastern regions from the accounts of "Hennepin, DuPratz, Charlevoix, and others"(Allen

1876:202). The bison were surrounded by fire except for a pre-determined opening at which they were killed as they tried to escape from the flaming prairie.

Colonel Dodge (1882:287-288) described a similar technique that occurred on the central plains in early October:

If the game was not abundant, a few of the most sagacious hunters were sent out, who, taking advantage of winds or streams, set fire to the grass in such way as to denude the prairies, except within an area of fifteen or twenty miles contiguous to the camp.

Here, if the conditions were right and the prairie fire was not violent, which, according to Dodge, was usually the case, the animals would get out of the way and collect in the unburned area, facilitating the hunt.

On the open plains of Pembina, Sibley (Schoolcraft 1856:98) reported a very similar incident, where the Indians who were hunting had fired the plains and afterward located the bison herd on top of a hill that was bare of grass to which the fire had driven them.

Perhaps the most significant use of fire by the Plains Indians was in controlling the movements of game, particularly bison. The most sophisticated use of fire was that utilized by all of the northern plains tribes in the initial phase of the bison drive, to literally herd the animals to a predetermined point from distances of up to forty miles. The skilled use of smoky fires and smoke creating firebrands so as to move the herd without stampeding it was extremely important and was interrelated with many other factors including weather, wind direction and velocity, topography, bison behaviour, and a vast practical knowledge of the environment on the part of the Indians. Although

control of the bison herds was never absolute, the Indians were able to prevent animals from moving into regions (Palliser 1863:57), often enemy territory, or to induce the herds to move into other regions (Hind 1971:336). On the plains of southern Saskatchewan in late July of 1859, Hind (1971:336) described the reason why the Cree fired the prairie.

One object in burning the prairie at this time was to turn the buffalo; they had crossed the Saskatchewan in great numbers near the Elbow, and were advancing towards us, and crossing the Qu'appelle not far from the Height of Land; by burning the prairie east of their course, they would be diverted to the south, and feed for a time on the Grand Coteau before they pursued their way to the Little Souris, in the country of the Sioux south of the 49th parallel.

Although the Indians have often been accused of carelessly firing the plains for trivial reasons, the fires they started not only helped maintain the plains in a short grass condition but fires deliberately set during one season brought benefits during a later one. According to Hind (1971:2:107):

The ranges of the buffalo in the north-western prairies are still maintained with great exactness, and old hunters, if the plains have not been burnt, can generally tell the direction in which herds will be found at certain seasons of the year. If the plains have been extensively burnt in the autumn, the search for the main herds during the following spring must depend on the course the fires have taken.

The Indians burned the plains in autumn or early spring, and occasionally in winter as observed by Peter Fidler south of present-day Calgary in early January of 1793 (Nelson & England 1971:299). The reasons for firing the plains at these seasons were given by several observers. Lewis and Clark (1969:1:269) near Fort Mandan on the Upper Missouri on March 6, 1805, reported that the plains

had been set on fire by the "Minnetarries [Hidatsa] for an early crop of grass, as an inducement for the buffalow to feed on." Later, on March 29th, 1805, near the mouth of the Yellowstone River, they reported that:

The Plains are on fire in view of the fort on both sides of the River, it is Said to be common for the Indians to burn the Plains near their Villages every Spring for the benefit of their horses, and to induce the Buffalo to come near to them (Lewis & Clark 1969:1:279).

Rudolph Kurz (1937:331), on April 26, 1852, passed great numbers of prairie fires near Fort Berthold in the Dakotas, stating:

At this season of the year Indians set the prairies on fire in order to remove the old, dried grass and provide room for the young, tender growth.

In the early fall of 1874, Colonel S.B. Steele (1915:69) of the Northwest Mounted Police, noted:

There were signs of prairie fires having run over the country the previous autumn . . . Indians and the half-breed hunters wilfully set the prairies on fire so that the bison would come to their part of the country to get the rich, green grass which would follow in the spring.

Hind (1971:1:292), in anticipation of the late arrival of the bison, observed on June 27, 1858, "The prairie had been burnt last autumn and the buffalo had not arrived from the south or west to people this beautiful waste."

The bison and other grazing animals apparently preferred the tender young grass that grew in those areas that had been recently burned. Macoun (Raby 1966:97), who wrote in 1895 that fires were harmful to the plains, conceded, however, that horses preferred the young grass to the old and young mixed together, and further noted:

On the prairie . . . where the fire had not been, the grass was twice as long (July 4th) as where it has been burnt over, but the horses always went to the new grass, although quite short in comparison to the other.

According to Dodge (1882:287-288), the effect of prairie fires on animal life was seldom severe and animals were usually able to evade the fires. Kurz (1937:331-332) described a slow burning fire set by accident which he thought was not dangerous under the circumstances but could have been if the grass had been high and additional brush and dried undergrowth had been present. On the other hand, the terrors of destructive, raging prairie fires have been vividly described by several authors (Inman 1970:103-110; Russell 1955:97-100). Reports of bison and other animals, blinded, burned, and often dead as a result of prairie fires were not uncommon.

Certainly the size of early prairie fires was awesome. For example, Sam Steele (1915:69) reported that "large tracts of country had been burned every year." The size of those tracts was indicated by Palliser (1863:57) who commented that in autumn when the grass was tinder dry, "fires were very common," and a spark was "sufficient to set 200 square miles of prairie in a blaze." Hind (1971:1:292) described the occurrence of a much larger fire:

From beyond the South Branch of the Saskatchewan to Red River all the prairies were burned last autuman, a vast conflagration extended for one thousand miles in length and several hundreds in breadth. The dry season had so withered the grass that the whole country of the Saskatchewan was in flames . . . we traced the fire from the 49th parallel to the 53rd, and from the 98th to the 108th degree of longitude. It extended no doubt to the Rocky Mountains.

Fire was especially destructive to brush and timber (Hind

1971:1:294 ; Palliser 1863:57). Evans (1927:196), travelling near present-day Stella, Nebraska during June in 1835, reported:

It is the opinion of many well acquainted with the prairies that the annual fall fireing of them by the Indians has caused the scarcity of timber indeed it appears very natural from the circumstances of their being timber near water courses and wet places where fire cannot have access--It is the custom among those Indians to fire the prairie every autumn I think timber might easily be cultivated in these prairies.

Hind (1971:1:337) was of the opinion that extension of the prairie was due to fires caused by the Indians, and if the fires ceased, larger areas could be reclaimed, for as he stated:

If a portion of the prairie escapes fire for two or three years the result is seen in the growth of willows and aspens, first in patches, then in large areas, which in a short time become united and cover the country, thus retarding evaporation and permitting the accumulation of vegetable matter in the soil. A fire comes, destroys the young forest growth and establishes a prairie once more.

Modern studies of burning and its effects on grasslands by soil biologists and range management researchers confirm many observations found in the early historical literature.

Although the studies of Clements and Chaney (1936:33-36) indicated that fire favoured the growth of deciduous trees and shrubs over grasses, very recent studies by Wells (1970), Rowe (1969) and others have revealed otherwise. For example, Wells (1970: 198-199) found that:

. . . the seasonally dry perennial grasses serve as highly flammable fuel that may burn with sufficient heat to injure or kill woody plants, and yet a new crop of grass is regenerated from protected buds after each fire.

Concerning damage to different plants from two early autumn fires in southern Saskatchewan, Rowe (1969:318) reported that in

late May of the following spring the fires had done little damage to the grasses on stony hillsides and hilltops where vegetation had been sparse, but on the gentler slopes where pre-burn vegetation had been dense, the fires were more destructive. Launchbaugh (1964:6), from studies in the central Plains, stated: "Where litter accumulations were heavy at the time of burning, the living vegetation and subsequent yields were greatly reduced." Consistent with Wells (1970), Rowe (1969:319) concluded:

. . . fire is relatively more destructive of woody perennials than of grasses and herbs. Fire clearly favours the expansion of grassland at the expense of shrubs and trees.

Important also, the growth and spread of seedling trees on the Plains would have been hazardous even during sequences of wetter years since the long period of growth to seed bearing maturity would have been nipped indefinitely by recurring prairie fires (Wells 1970:198-9).

Nearly all modern studies of the effects of grassland fires are concerned primarily with forage production rather than the long range effects of fire on plant and soil ecology.

In several studies on the Great Plains where total herbage yield was the main criterion for comparison between fall and spring burning, results showed that all burning reduced forage yields both the first and second years after burning, but no appreciable difference in yields was noted the third year (Trilica & Shuster 1969: Launchbaugh 1964). Plots burned in spring produced slightly more herbage than the fall burned plots during the first growing season but this was reversed during the second growing season showing no

distinct advantages in yields from spring burns over fall burns. Recovery of the grasses after a summer burn was quickest. However, on tall grass range, Trilica and Shuster (1969:331) reported greater yields after spring burns than after fall burns, but on the short-grass ranges, greatest herbage production followed fall burning. Successive annual burning apparently had no cumulative effect on total yields. Also, burning appeared to have favoured the seedstalk production of native grasses which are more fire tolerant than some of the introduced grasses (Trilica & Shuster 1969:333; Ehrenreich & Aikman 1963:129).

According to Ehrenreich and Aikman (1963:114), the dead plant litter or mulch intercepts some precipitation, and "the amount that reaches the ground depends on the type and quantity of mulch as well as the type, amount and intensity of precipitation." Snow tends to accumulate on mulch rather than on bare ground, increasing snow melting time and infiltration rate, but reducing evaporation from the soil surface. Therefore, a heavy mulch causes the ground to warm up slowly in the spring delaying the start of growth.

Some investigators have reported growth in the spring to start earlier on burned areas than on unburned areas (Aikman, 1955; Clements & Chaney 1936). Ehrenreich and Aikman (1963:125 and 128) found that:

Plants on recently burned areas began growing two to three weeks earlier than plants on unburned areas. However, plants on unburned areas grew faster during the latter part of the growing season so that there was no significant difference in total herbage yield between burned and unburned areas.

Since later in the growing season herbage yields are

essentially the same on burned and unburned areas, then burning by the Indians during the previous autumn would have been for another reason. This reason, I believe, was for the earlier growth of grass the following spring, which the bison preferred and was the inducement reported by Lewis and Clark (1969:1:269). Thus the Indians were able to exercise some control over the movements of the bison seasonally, and therefore, would know in what areas or tracts the bison could be expected after they scattered from their winter bedding and feeding grounds.

In summary, spring burning may favour increased yields on tall grass ranges whereas fall burning may increase yields on short grass ranges. Damage by burning is less on sparsely vegetated areas than in areas of dense vegetation, thereby clearly favouring grasslands at the expense of shrubs and trees. Those areas with heavy litter retain and utilize moisture better than more barren areas, but growth in the spring of the year begins two or three weeks earlier on burned areas than on unburned areas.

CHAPTER III

BISON: GENERAL CHARACTERISTICS AND BEHAVIOUR

Introduction

The historical literature contains considerable information on bison behaviour in its many aspects. Studies of present-day bison by game biologists and others have not only confirmed the observations of many trained and untrained observers during the 18th and 19th centuries, but have added new dimensions to our knowledge of this subject.

Since their near extermination in the 1880's, the bison have become dependent on man in varying degrees, accustomed to his presence. Because of this, some scholars have felt that substantial changes in bison behaviour have gradually taken place, making the modern behavioural studies of little value to their scholarly pursuit of the former great herds that covered the plains. However, many public and private "tame" bison herds are found throughout North America. These herds, depending on the closeness of their confinement, are thus, in varying degrees, dependent on man for food and other necessities to maintain their existence. Some herds are maintained in essentially the same dependence as domestic cattle. Obviously, these small herds, accustomed to the continual presence of man are less wary of humans than their former wild counterparts, and through familiarity have permitted people to approach them more

closely than would have the former wild herds or the present-day wild herds. Furthermore, except in the very large Wood Buffalo National Park in Alberta, nearly all present-day bison herds have some restriction of their seasonal movements. Knowledge of this aspect of their behaviour and its related effects must be gleaned primarily from the historical documents. More important, however, the tame herds, scattered in preserves throughout Canada and the United States, provide increasing information on bison social behaviour as well as bison adaptation to different habitats. Since their near extermination in the 1880's, no long term studies of possible change in bison social behaviour have been done.

Aside from the so-called "tame" herds, there are a number of bison herds that forage for themselves year round with a minimum of human contact, and may properly be termed "wild" herds. Among these are the Hayden Valley herd in Yellowstone National Park in Wyoming, the Crow Indian Reservation herd in Montana, the Wind Cave National Park herd in South Dakota, and the many herds in Wood Buffalo National Park in northern Alberta, which consists of 17,300 square miles of unfenced domain (Soper 1941:349). The Hayden Valley herd, since it is found in Yellowstone National Park, fends for its own food but also defends itself against one of its natural predators, the grizzly bear. In Wood Buffalo National Park, the bison occasionally fend for themselves against both wolves and grizzly bears.

Important behavioural studies of these wild herds have been completed and some of the results published. The most

thorough early study of modern herds was that of Soper (1941) in Wood Buffalo National Park. Another important monograph on the social behaviour of Bison bison bison was McHugh's (1958) study of herds in Yellowstone National Park, the Jackson Hole Wildlife Park in Wyoming, Wind Cave National Park, the Wichita Mountains Wildlife Refuge in Oklahoma, and the Crow Indian Reservation herd. Other excellent work and studies include those of Halloran (1957, 1968), Halloran and Glass (1959), Nelson (1965), and Fuller (1966).

In this paper, priority has been given to the ethno-historical evidence which is supplemented by modern behavioural studies of bison. Where the historical record was found blank or wanting, a hopefully judicious use of the recent studies has been utilized.

General Characteristics

In many ways bison behave like domestic cattle, but their differences are also observable. According to Allen (1876:62 & 64):

The behaviour and movements of the buffalo are in general very much like those of domestic cattle, but their speed and endurance seem to be far greater . . . they indulge in similar gambols, and when belligerent, in similar demonstrations.

Both Grinnell (1904:129) and Dodge (1959:123) agreed with Allen. However, Allen (1876:64) regarded the bison's propensity to wallow as unlike anything in the habits of domestic cattle.

Concerning the docility of the bison, Buffalo Jones (Inman 1970:247-249) the late 19th century cattalo breeder, would have us believe that the bison, " . . . under domestication yields as readily to the cowboys will as do our native cattle." However, his statements were usually equivocating as shown in the following

example:

I am firmly of the opinion that there are few buffalo, excepting the master of the herd, that cannot be subdued by man, if he only possess the nerve to face them, never yielding or turning his back on them (Inman 1970:249).

Among other experienced hands with bison was Seton (1929:672) who wrote, "The buffalo is a dangerous animal, the only really dangerous one in America." Soper (1941:398) observed that "As a reactionist, the ways of the bison can never be predicted." From his studies of "tame" and "wild" herds, McHugh (1958:8) declared that "Buffalo are potentially dangerous animals and should always be approached with caution."

From the historical evidence, the best summation of the literature on bison docility and domesticability is that of Roe (1970:706-714 & 897-898) wherein he states:

. . . Bison americanus was fundamentally untamable. For though they have more than once been (as was thought) successfully broken to harness, they have almost always sooner or later turned on their trainers, and some of these latter have been killed by them. The large herd in Wainwright Buffalo Park (Alberta) were for many years apparently docile and accustomed to man . . . After eighteen or twenty years in the park, the herd suddenly turned cross and dangerous, and the gates had to be closed to visitors afoot.

Size and Weight

The great size of the American bison has been recorded in some detail by Allen (1876:37) and Seton (1909:248) whose measurements are in close agreement. The adult male is larger than the female, and what Seton (1909:248) considered a typical large bull measured ten feet and two inches from the length of the head and body to the insertion of the tail. Allen (1876:37) using the same

points for measurement reported the length of the bull to be about nine feet, and for a cow about six and a-half feet.

Seton (1909:249) reported a height at the shoulders of five feet eight inches for a large bull, adding that specimens over six feet had been recorded. Allen (1876:37) gave the height for the adult male at the highest part of the hump as about five-and-a-half to six feet, and for the adult female at the same point, about four-and-a-half feet.

The average weight for a bull was about 1880 pounds, but heavier bulls were killed (Seton 1909:249). Alexander Henry (Henry & Thompson 1965:171) and Seton (1909:249) were in agreement that adult cows usually weighed about 700 to 800 pounds.

Studying herds on the Wichita Mountains Wildlife Refuge in Oklahoma, Halloran (1957:139) reported the weights of male bison up to the age of seven years but these animals had not attained their full growth. This was attained at about eight years. From butchered animals, Halloran (1957:139) determined the average percentage yield (the ratio of dressed weight to live weight) for both sexes as 54 percent of the live weight. Dressed weight was the animal including bones but minus head, hide, and entrails.

Senses

A characteristic of the bison that possibly affects certain other aspects of his behaviour is his poor eyesight. DeSmet (1905:4:1398) and Schoolcraft (1856:95), among others, noted that the bison's poor sight made him appear stupid, and therefore, dependent on his keen sense of smell and hearing to warn him of danger.

Soper (1941:399), who regarded the bison's sense of smell to be remarkably sensitive, considered the bison's sight to be the poorest of the senses, which made him peculiarly indecisive under conditions where neither scent nor hearing could serve, and made him approachable to within a very short distance from downwind. On the other hand, McHugh (1958:6) pointed out that the vision of bison was not to be underestimated since they apparently spotted moving jeeps more than a mile away.

McHugh (1958:6) agreed, however, that the bison's sense of smell was more acute than his vision, and found that the wild Hayden Valley herd reacted to scent at a distance of at least a mile. Earlier observers, (Inman 1970:246; Garretson 1938:46) reported that bison reacted to scent at distances of four miles or more. Henry (Henry & Thompson 1965:2:519) and DeSmet (1905:3:1029-1030), noted the importance of scent to the success or failure of the hunt. However, Hind (1971:112) observed that blind buffalo, their eyes destroyed by prairie fires, had a quickened sense of hearing and smell that increased their alertness and made them more difficult to approach than those possessing sight.

Speed

References have been made in the historical literature to the speed of bison, usually in relation to horses. Dodge (1959:126) remarked that "A buffalo can run only about two-thirds as fast as a good horse; but what he lacks in speed he makes up in bottom or endurance." This is apparent from the bison chase on horseback where the riders sneaked as close as possible and then

rushed into the herd as it began stampeding away. Within two miles the horses usually dropped the chase as the bison galloped on.

Despite an apparent sluggishness, adult bison can move with surprising rapidity, and though the normal gait is a slow plodding walk, a man would have to jog trot to overtake them (Soper 1941:401).

A more precise idea of their speed was clocked on several occasions by McHugh (1958:9):

Herds of buffalo chased by a jeep in the Crow Reservation maintained a steady speed of 30 miles an hour . . . on one occasion a group spurted from behind and passed the jeep, travelling at about 35 miles an hour.

Cottom and Williams (1943) measured the speed of a three-year-old bull on level ground as 30 miles an hour and states that older and younger animals were slower. Howell (1944) timed the top speed of a two- or three-year old buffalo at 32 miles an hour.

McHugh (1958:9) also observed that bison increased their speed on downhill slopes as they proceeded toward some goal such as water or food, or when stampeding, and also when nearing a destination or returning to a herd after a temporary separation.

For comparison, the speed of horses depends on the type of horse, conformation, and condition. The approximate running speed of a fast horse is about 35 miles per hour (Summerhays 1970:32). Some early world records for running horses show that speed drops rather quickly with the distance run. For distances of up to three-eighths of a mile speeds of over 40 miles per hour have been recorded, and for a distance of one-half mile to two miles, speeds between 36 and 40 miles per hour are recorded. For a distance of four miles, a very fast average speed was about 33 miles an hour (Howell 1944:242).

The buffalo hunting tribes on the northern Plains trained their fastest and best horses for chasing buffalo. How fast these horses could run or how they compared with the early champion racers is conjecture. Undoubtedly, the Indian trained "buffalo runners" could run as fast as or faster than the buffalo. Over long distances, however, the bison had greater stamina.

Maneuverability

Associated with his speed is the bison's maneuverability. Soper (1941:401) observed that " . . . the bison in deep powdery snow can for a time travel faster than a galloping dog train on a broken trail." In Yellowstone National Park where the snow is usually quite deep in the winter, McHugh (1958:9-10) reported that the Hayden Valley herd avoided ravines, level meadows and forests when the snow was up to four feet deep, spending most of their time on the bare or near bare areas. They also had a network of well-packed trails through the deep snow to the ridge tops. However, they were able to negotiate deep unbroken snow although travel was slow under these conditions for both cows and bulls.

Deep snow in winter also favoured the hunting of the buffalo. Where the snow drifted into ravines to excessive depths that the bison could not negotiate, there they were driven and dispatched by Indians on snowshoes (Catlin 1965:1:253; Seton 1909:271). In the spring of the year, the alternate thawing and freezing of the snow often produced a hard crust that yielded to the weight of the bison but supported the hunters on snowshoes (Simpson 1843:405).

Behaviour

Daily Round

The "daily round" or the behaviour of bison during an entire 24-hour period was divided by McHugh (1958:12) into two main kinds of activity:

(1) Feeding behaviour which included a short period of walking to select and eat natural forage or hay, and (2) non-feeding behaviour with much loafing behaviour such as lying and standing, and also ruminating, traveling, watering, licking salt, playing and grooming.

Feeding commenced at dawn or very early in the morning and alternated throughout the day with periods of non-feeding (Seton 1909:282; Soper 1941:399; McHugh 1958:12). Often toward noon, "the old cow will arise and march toward the water with the band behind her" (Seton 1909:282).

Hornaday (1889:418) and later McHugh (1958:12) and Nelson (1965:94) noted that "Feeding activity sometimes declines during periods of high temperature around noon." This particular activity of bison was utilized by Palliser (1863:90) at the commencement of a hunt in late July:

I allowed the men to wait until noon, by which time the buffalo would begin to lie down after feeding. They are then not so swift as if pursued early in the morning.

According to Denig (1930:539):

. . . the buffalo are more easily approached in the middle of the day when they lie down for an hour or two, and if not asleep their range of vision is much diminished by that position and intervening grass.

As the afternoon wears on, the feeding activity begins again and continues until sundown and at times into complete darkness.

In Wood Buffalo National Park, Soper (1941:400) pointed out that in winter activity was less varied. Due to the shorter days, the bison might not stir until nine o'clock in the morning, but unlike summer, there were no long periods of dalliance around noon and, " . . . every energy is bent to satisfy an enormous capacity . . ."

The watering activity of bison has come under discussion by Roe (1970:106-113) with especial concern for how often bison require and go to water, but with inconclusive results. Soper (1941:399-400) observed that:

Much of the drowsy, brilliant midday period is devoted to drinking and dreamy inactivity, interposed with fitful scratching, indolent napping and rolling . . . However, in winter snow is always at hand and no time is lost from feeding.

From Nelson's (1965:35-37) report, the drinking habits of the Henry Mountain herd in Utah indicate the great adaptability of the bison to different habitats:

Water needs of the bison seemed not to be great. Where water was close at hand they utilized it daily although they remained in waterless areas for some time. Animals spent a considerable period of time on Cedar Point on the Burr Desert in the spring of 1963. No permanent water supply is known to be present. Although they must have found some water during this period, it is unlikely that a constant daily supply was available. The animals trail considerable distances to water. In the winter time snow was utilized when it was available.

Very little time was spent at the water hole. As soon as their water needs were satisfied, they immediately began grazing and moving away from the water and did not show a tendency to hang around the area as is common with cattle.

When little water or snow was available, the herd moved five miles or more to water (Nelson 1965:23).

The studies of Soper (1941:399), McHugh (1958:12), and Nelson (1965:23) all confirm the diurnal nature of bison activity.

From meagre nocturnal observations, McHugh (1958:12) reported that occasional feeding and travelling occurred during the night. A similar observation was made by Cahalane (1947:77), who had known bison to feed and move about " . . . on dark nights, especially in summer," but considered this to be out of the ordinary. On the other hand, Soper (1941:399) reported that in Wood Buffalo National Park the normal activities of bison were entirely diurnal. Nelson (1965:23) witnessed little or no night movement, and unless disturbed, bison in a particular area at nightfall could usually be found in the same general area at daybreak.

The daily distance travelled by bison varied due to many circumstances. During the rut and in the winter months, daily movements were of shorter distance than at other seasons. Where water holes were scarce, however, the daily distance travelled was greater. According to McHugh (1958:12), the Wind River herd, in late summer, " . . . sometimes made daily round trips to water of at least six miles."

Nelson (1965:23) found that, "On occasions during summer the daily regimen of shading, feeding, and watering was completed within distances of a few to several hundred yards." On other occasions, movements were one to several miles, and when disturbed, the bison travelled up to ten miles.

The daily movements in winter varied the same way, for as Cahalane (1947:77) stated:

They may feed in a restricted area for days or as much as a week. Then the wanderlust may seize them, and the herd will move five or ten miles in as many hours, stopping only for a

mouthful here and there before settling down once more. They are much more sedentary in winter.

Herd Composition

The organization and composition of bison herds is wholly simple and they may be divided into two groups: (1) bull groups, containing mature males and an infrequent old barren cow and, (2) cow groups, containing females and a smaller number of males (McHugh 1958:14).

During the rut when many cow groups coalesced and were joined by bull groups, McHugh (1958:14) found that the increase in group size did not create a third classification since these rut groups remained essentially cow groups.

According to Allen (1876:56), the cows with their calves were generally found towards the middle and to the front of the herds with younger animals of both sexes mingling with the cows, as did also the younger and middle-aged bulls. Older bulls were found nearer the outside of the herd with the old patriarchs bringing up the rear. Often, these very old bulls were found miles from the main herd, either singly or in small groups of three or four to a dozen individuals.

McHugh (1958:14 & 37), in close agreement with Allen, reported that the bull groups, smaller in size than cow groups, were composed mostly of four-year-olds and older with some three-year-olds and an occasional two-year-old bull. Cow groups during the non-breeding season were composed of cows, yearlings, calves, two-year-old bulls, some three-year-old bulls, and rarely bulls four or more years of age.

The intermingling and coalescing of herds observed by McLugh (1958:16) and Nelson (1965:22) agreed with the much earlier and excellent description by Dodge (1959:123-124) who, unobserved, carefully watched free roaming herds while they were feeding and described the activity as follows:

I have seen two or more small herds merge into one, or one larger herd separate into two or more. This is done quietly, gradually, and as it were accidentally, in the act of feeding, each buffalo seeming only intent on getting his full share of the best grass. The cows and calves are in the centre, the bulls on the outside. When two feeding herds approach each other and merge into one, the only perceptible change--and this is so gradual as scarcely to be noticeable--is that the bulls on the sides of contact work themselves out towards a new circumference, which is to enclose the whole; and when a larger herd breaks by the same gradual process into smaller ones, the bulls instinctively place themselves on the outside of each.

When pursued the herds rush together into one compact plunging mass. As soon as the pursuit is over, and the buffalo are sufficiently recovered from their fright to begin feeding, those on the outside of the mass gradually detach themselves by breaking into small herds, until the whole large herd is in the normal condition.

According to McHugh (1958:16), the small bull groups:

. . . tended to be on the edges of the herds, and the last animals in herd movements were regularly bulls. The presence of bulls on the flanks and in the rear of herds was noted by several authors (Allen 1876:55; Bradbury 1904:147).

Old bulls on the outskirts of the herds were believed by Inman (1970:231) to act as sentinels. However, Allen (1876:56) considered them to be the least watchful of all members of the herd and dismissed this notion as "wholly a myth." McHugh (1958:16) stated, "there was no evidence these peripheral bulls were sentinels."

Subgroups

According to McHugh (1958:16):

Wild groups of all sizes and types readily broke into smaller subgroups that were spatially distinct from other clusters in the group.

"These subgroups were of similar or random age and sex classes" (McHugh 1958:37). Since many of these subgroups consisted mostly of males, subgroups of older males are presumably what have been referred to in early historical accounts as "herds" of bulls.

Nothing in the study led McHugh to conclude that subgroups were blood relations or "clans" as stated by a number of authors (Grinnell 1904:129; Inman 1970:234; Seton 1929:693; Soper 1941:391-2). McHugh (1958:16) personally concluded, "that subgroups or group formation was flexible and depended little on blood relations beyond the age of one year."

Herd Leadership

Leadership refers to the animal that initiated movement or led the others during movements. Although some observers may have confused the dominance of the bulls, especially during the rut, for herd leadership, it is generally conceded that the cows maintained leadership during most herd movements (Roe 1970:106). Seton (1909:274), moreover, stated unconditionally that among bison " . . . their leader is always an old cow."

Soper (1941:392), possibly mistaking dominance for leadership, found that in Wood Buffalo National Park, a large male appeared to be the common leader. However, Soper may have been making his observations at the beginning of the rut, and the same may have applied to Seibert (1925:205) whom Soper (1941:392) quoted as follows:

During the summer, they are found in herds, usually of from twelve to fifty animals, and quite often singly or in pairs. These herds are composed of the females, calves and younger animals and are accompanied by one particularly large bull who appears to be the leader. This leader, in every case observed was a majestic, ferocious looking animal, far exceeding the average in height and size.

It is also quite possible that both Soper and Seibert were entirely correct. However, except for the period of the rut, the observations of Soper and Seibert conflict with a large body of historical documentation and with the observations of McHugh (1958: 15) who not only failed to mention a large bull leader, but from his observations of both cow and bull groups in different modern herds formulated the following trends:

Older bulls tended to lead bull groups more often than younger ones, but here was great variation. Cow groups were led principally by older cows and seldom by younger cows or bulls. Leadership changes among the cows.

Stampedes and Herd Leadership

Among present-day bison herds, both tame and wild, McHugh (1958:11) found that stampedes resulted from seemingly insignificant events such as the snapping of a twig, the sudden flight of birds or other animals, or simply by the sudden trotting or galloping of one or a group of bison. Initiated by a wary group, usually cows, stampedes were undertaken at either a trot or a gallop, covering distances of a few hundred feet up to several miles. Among wild herds, like the Crow Reservation herd or the Hayden Valley herd, the approach of humans even at considerable distances was enough to trigger stampedes of a mile or more.

Prior to a stampede, the bison, who were not in close herds,

were usually scattered about at a little distance from one another (Grinnell 1970:270). At the first sign of alarm or danger all of the buffalo in the area "bunched" or massed together quickly, the subgroups stampeded to join the main group, and the herd usually took the direction of the first group (McHugh 1958:11).

Bunching at the first sign of alarm is characteristic of bison and has been reported by many early observers including Dodge (1959:124-5), Grinnell (1904:136), MacDougall (1896:278), and by Wildlife biologists McHugh (1958:11) and Soper (1941:397).

As the stampede progressed, the ever-alert cows, swifter than the bulls (Grinnell 1904:130), pressed to the front and left the slower bulls behind.

According to Allen (1876:56), the timidity and watchfulness of the cows through their care of offspring accounted for their initiative in herd movements, keeping them to the front. However, other observers, Audubon & Bachman (1851:41) and Dodge (1959:128), in agreement with Grinnell (1904:130), conceded that the speed of the cows and younger animals accounted for their foremost position during stampedes.

Whether or not he was referring to stampedes was not specifically mentioned, but McHugh (1958:10-11) noted:

Contagious behaviour was important and especially noticeable when all animals were facing in the same direction and moving at the same rate. Dominant animals in the center or rear of the group seemed to direct the procession by moving all subordinates ahead of them.

Grinnell (1970:271) pointed out that it was the habit of bison when stampeded to dash "blindly forward, against, over, or

through anything that might be in the way." Therefore, when stampeding, the herd followed its leaders. Unable to stop or turn aside, they were crowded upon and pressed forward by those behind so that they plunged into mire or quicksand (Grinnell 1970:271), or into pounds (Allen 1876:70), owing to the irresistible pressure of those behind who were unaware of the danger ahead.

The Rutting Season

In late July of the year 1810, while descending the Missouri River, Bradbury (1904:188-189) and his party were witness to a rare experience, the sound and sight of bison during the rutting or breeding season, which he described as follows:

. . . we proceeded, and had not gone more than five or six miles before we were surprised by a dull hollow sound, the cause of which we could not possibly imagine . . . it increased every moment in loudness, and before we had proceeded far, our ears were able to catch some distinct tones, like the bellowing of buffaloes . . . On gaining a view of it, such a scene opened to us as will fall to the lot of few travellers to witness. This plain was literally covered with buffaloes as far as we could see, and we soon discovered that it consisted in part of females. The males were fighting in every direction, with a fury which I have never seen paralleled, each having singled out his antagonist. We judged the number must have amounted to some thousands, and that there were many hundreds of these battles going on at the same time, some not eighty yards from us . . . at this season the females would naturally admit the society of the males . . . I shall only observe farther, that the noise occasioned by the trampling and bellowing was far beyond description.

With commencement of the rutting season, an almost complete dissolution of the bull groups occurs because the bulls, mingling with the cows, increase the average group size (McHugh 1958:23). The merging of small groups or herds into larger masses during the rut was reported by many early observers including Catlin (1965:2:13)

and Hornaday (1889:415-416), and among modern herds by McHugh (1958:23), Nelson (1965:30) and Soper (1941:390).

During the rut the bulls dominated these larger herds. For example, Nelson (1965:30) reported that in a herd of 86 bison, "A single bull dominated the herd and all other bulls in the herd respect him and gave way to his advances." None of the bulls was apparently driven from the herd observed by Nelson. As more cows came into oestrus, the subdominant bulls followed them continuously.

From McHugh's (1958:30) observations, the results of battles between bulls ended with the loser often leaving the herd, but "there was no indication that such 'outcast' bulls could not enter the same group a few hours later or enter any other group." As Grinnell (1904:131) noted, "the contest usually ends in nothing more important than the driving off for a time of the weaker bull." McHugh (1958:38) summed up his observations, saying, "Bulls circulated freely among herds. Lone bulls were apparently not outcasts but voluntary isolates."

There is some agreement that the rut begins during July. These observers include Allen (1876:56), Cahalane (1947:79), Fuller (1966:18), Grinnell (1904:131), Nelson (1965:29), and Seton (1909:288).

Seton (1909:288) believed that the breeding season began in July but was " . . . earlier in the south and later in the north." However, Catlin (1965:1:249), travelling in present-day South Dakota, reported the breeding season to be in "August and September." For the herds in Wood Buffalo National Park, Fuller (1966:18) stated that, "Mating activity begins in July and the peak of the rut is reached between August 10 and 20," which appears to be true

for most herds, tame or wild, north or south. However, there are anomalies that appear in the record.

McIlugh (1958:23) reported that the rutting season of the Hayden Valley herd,

. . . ran from about June 15 to September 30, with less activity during the first and last two weeks. The rut in Wind Cave ran from about June 23 to September 14. The sporadic birth of calves outside the main calving season would depend on occasional rutting activity at any time of the year.

However, the Henry Mountain herd in Utah began breeding in late July (Nelson 1965:29). For the Wichita Mountains Wildlife Refuge herd in Oklahoma, Halloran (1968:25-26) reported:

For the past 12 years, the date that the first calf of the season was seen on the refuge has been recorded. Although, for many years, bulls have been with cows the year round, the first recorded calves have come in a 29 day period between March 10 and April 7, inclusive.

Eleven of these observations have been in a 15 day period between March 24 and April 7. The median dates of this period are March 30 and 31. Two of the first births have fallen on March 31.

The gestation period of bison is "approximately 270 days" (Mosby 1960, p. 195). If March 31 is considered as an average first day of birth, then June 5 could be calculated as an average first day of effective breeding. Occasionally calves are born late in the fall.

Although the peak of the breeding season occurs generally in July and August and many competent observers of bison agree that it begins in July, there is disagreement among some of these observers as to the onset and length of the rutting season. For example, Cahalane (1947:79) and Grinnell (1904:131) reported the length of the rut to be two months, Branch (1929:6) and Garretson (1938:38) three months, Nelson (1965:51) three to three-and-a-half months, and Fuller (1966:18) four months. Soper reported that new-born calves were seen in every month of the year, implying that conception

could take place also in any month (Fuller 1966:18). Knowing that the gestation period is approximately 270 days (Brown 1936:12) and may extend to 285 days (Nelson 1965:31; Seton 1909:270), this disagreement becomes enlarged by apparent discrepancies in the statements of several observers with reference to the length of the breeding season as compared to the length of the calving season. For example, Allen (1876:56-57) states:

The rutting season begins in July, but is not at its height till the following month.

However, he continued, after a pregnancy of nine months, ". . . the calves are born from the beginning of March till the end of June," a period of four months. Grinnell (1904:131) states that "the rutting season begins in July and lasts about two months." However, his inconsistency on the length of the calving season comes from two separate statements. In 1892, Grinnell (1970:271) reported, "The Buffalo calf is born from April to June," and in 1904 (Grinnell 1904:132), he stated, "The buffalo cow produces, usually, a single calf, which may be born during the months of March, April, May, or June," a period of four months. According to Seton (1909:288), "The annual ferment . . . set in during July . . . and continues about two months." With regard to gestation, he stated, "Some time in April usually, though possibly as early as January and as late as August, the full-grown cow has finished her 9½ months' gestation."

Allowing some flexibility in the gestation period for each individual cow, may we not infer that these observers were referring

to the peak of the rut that occurred during the two month period of July and August, but which was actually of four months duration or longer so as to complement a calving season of four months duration or longer that usually peaked during the months of April and May the following year?

On this point, Nelson (1965:30) reported that "No cows with trailing calves were observed in heat during the height of the rutting season." However, he added that it was possible some cows with calves were bred in late fall or early winter. This agrees with Fuller's (1966:18) personal observations that " . . . new-born calves are rarely seen after August," and with his earlier suggested explanation that cows accompanied by calves breed later (Fuller 1961:288-9). The reason for this he explained was that:

A virgin cow would probably breed at the peak of the August rut and produce a calf the following May. The presence of the calf seems to reduce the chance that the cow will breed again in August, but there is still a good chance of conception occurring during some later oestrous period. The calf would come toward the end of the calving period, possibly as late as July, which probably precludes August breeding altogether and reduces the chance that the cow will breed during a later oestrous cycle. The following summer, since no calf would be produced, the cow would again be ready to breed in the main August rut.

The general behaviour of bison during the rut apparently changed somewhat from their behaviour during the remainder of the year. The bulls appeared to become less wary during the rut, depending on the always wary cows to alert them of danger (Nelson 1965:30). Despite any decrease in wariness among the bulls, "They are very fierce during this period and will often turn upon a man and pursue him for some distance (Henry & Thompson 1965:407)." However, mounted

Cree Indians, skilled in the habits of the buffalo, were able to impound them at the peak of the rutting season in late July and early August of 1858 (Hind 1971:354-6).

Calving

The main calving season ranges from the beginning of March till the end of June, a period of four months (Allen 1876:56-57; Grinnell 1904:132), but usually peaks in April and May (Grinnell 1970:271; Garretson 1938:38).

In the Wichita Wildlife herd, Halloran (1968:25-26), over a twelve year period, recorded the annual arrival of the first calves to be in a 29 day period between March 10 and April 7, inclusive. Nelson (1965:31) reported that in the Henry Mountain herd, " . . . the cows began dropping calves the last few days in April with the majority of the calves being born in May," and added, "The calving season may vary both as to inception and length." McHugh (1958:30) reported a main calving season from April 15 to May 31 for the Lamar Valley herd and a similar season in the Wildlife Park and in Wind Cave. In the Lamar Valley herd, there was a greater concentration of births in the central two weeks of the period.

Reports of calving outside the main calving season are common. For example, Audubon and Bachman (1851:47) recorded on August 7, 1843, that a cow just killed was near her time of calving. Henry (Henry & Thompson 1965:1:171), under an entry of February 28, mentioned that an Indian had brought in a dead calf "of this year." In both of these examples the event was considered unusual. Seton (1909:277), of course, who was very indefinite on the subject believed

that the bison cow gave birth sometime in April usually, though possibly as early as January and as late as August.

There was a scattering of calves outside the main season in most of the herds studied by McHugh (1958:30):

A few calves were born from June through October in all Yellowstone Herds, the Crow Reservation, Wind Cave, and the National Bison Range.

During the winter season of November to March, the birth of calves in the Yellowstone herds occurred at least five times and at least once in the Niobrara National Refuge (McHugh 1958:30).

Seasonal Movements

Information on the location of bison at one season or another can be found throughout the accounts of early Plains travellers. These accounts simply verify the fact that bison were to be encountered in herds on all parts of their range at all seasons. However, certain localities on the northern Plains appear to have been favoured at different seasons by what may be termed resident herds.

There is no reason to believe the popular notion that the bison herds that summered in Saskatchewan wintered in Texas (see Grinnell 1904:138; Roe 1970:521-542). Grinnell (1904:137), who did not succumb to this fantasy, stated:

There were, unquestionably, certain seasonal movements, east and west, and north and south, yet these movements were never very extended, and constituted nothing more than the very general shiftings which were made by many ruminants between a summer and winter range.

Most ungulates on the Plains were local in their habits. The bison, for example, were attached to a particular range that was

not left without good reason (Grinnell 1904:138-142).

Occasionally, bison herds failed to appear in an area as expected. Hind (1971:109) attributed this to prairie fires which were definitely a cause. Changes affecting the grasses and forage preferred by the bison would likely be a prime cause for them to disappear from one locality at a given season and move into another within their range. Weather changes, availability or lack of forage in a given locality, hunting by the Indians, and ecological change generally would affect the movements of bison, and therefore, of the Indians as well. For example, in 1878, as a result of prairie fires and mild weather the bison failed to arrive at their usual wintering ground and remained out on the plains (Nelson 1973:167). Furthermore, as the 19th Century progressed, bison were exterminated from one region after another along their eastern range of the Great Plains. The extermination swept westward, accelerating with completion of the Union Pacific Railroad in 1869, disrupting the seasonal movements of the bison as they became plagued by the hide hunters.

Although most of the early historical recordings of the bison's seasonal movements are brief, impressionistic comments, some accounts give rather precise information on these movements and the localities where, with regularity, herds could be expected at specific seasons, year after year. According to Allen (1876:61):

The local movements of the buffaloes are said to have been formerly very regular, and the hunters conversant with their habits knew very well at what points they were most likely to find them at different seasons. Of late, however, the buffaloes have become much more erratic, owing to the constant persecutions to which they have been for so long a time subjected.

As late as 1858, Hind (1971:2:107) reported that "the ranges of the buffalo in the northwestern prairie are still maintained with great exactness . . . " Annual herd movements into specific localities over long periods of time occurred with regularity when we consider that many bison pounds and jumps became deeply stratified sites through repeated use. An example is the Old Women's Jump south of Calgary in Alberta (Forbis 1960).

On the northern Plains, Palliser (Spry 1963:48) was told in early August of 1857, that every winter the bison moved from the plains into the forests of the Turtle Mountains. Over a much vaster range, Hind (1971:107-108) described the seasonal movements of the bison in some detail:

Red River hunters recognize two grand divisions of buffalo, those of the Grand Coteau and Red River, and those of the Saskatchewan. Other ranges of immense herds exist beyond the Missouri towards the south . . .

. . . The north-western buffalo ranges are as follows. The bands belonging to the Red River Range winter on the Little Souris, and south-easterly towards and beyond Devil's Lake, and thence on to Red River and the Shayenne. Here too, they are found in the spring. Their course then lies west towards the Grand Coteau de Missouri, until the month of June, when they turn north, and revisit the Little Souris from the west, winding round the west flank of Turtle Mountain to Devil's Lake, and by the main river (Red River), to the Shayenne again. In the memory of many Red River hunters, the buffalo were accustomed to visit the prairies of the Assinniboine as far north as Lake Manitobah, where in fact their skulls and bones are now to be seen; their skulls are also seen on the east side of the Red River of the north, in Minnesota, but the living animal is very rarely to be met with.

Farther west in what comprises the plains of the present-day south Saskatchewan, Hind (1971:2:108-109) described their movements as follows:

The great western herds winter between the south and the north branches of the Saskatchewan, south of the Touchwood Hills, and beyond the north Saskatchewan in the valley of the

Athabaska; they cross the South Branch in June and July, visit the prairies on the south side of the Touchwood Hill range, and cross the Qu'appelle valley anywhere between the Elbow of the South Branch and a few miles west of Fort Ellice on the Assiniboine. They then strike for the Grand Coteau de Missouri, and their eastern flank often approaches the Red River herds coming north from the Grant Coteau. They then proceed across the Missouri up the Yellow Stone, and return to the Saskatchewan and Athabaska as winter approaches, by the flanks of the Rocky Mountains. We saw many small herds, belonging to the western bands, cross the Qu'appelle valley, and proceed in single file towards the Grand Coteau in July 1858. The eastern bands, which we had expected to find on the Little Souris, were on the main river (Red River is so termed by the half-breeds hunting in this quarter). They had proceeded early thither, far to the south of their usual track, in consequence of the devastating fires which swept the plains from the Rocky Mountains to Red River in the autumn of 1857. We met bulls all moving south, when approaching Fort Ellice; they had come from their winter quarters near the Touchwood Hill range. As a general rule the Saskatchewan bands of buffalo go north during the autumn, and south during the summer. The Little Souris and main river bands, go north-west in summer and south-east in autumn.

Earlier, Hind (1971:1:339-340) pointed out why the Saskatchewan herds along the Grand Coteau moved north in autumn toward the Touchwood Hills:

Ponds and lakes are numerous on the Grand Coteau side, and it is probably on this account that the buffalo cross the Qu'appelle valley near the Moose Jaws Fork and west of Buffalo Pound Hill Lake; in the winter they keep towards the Touchwood Hills for the sake of shelter, and the excellent herbage which grows in the beautiful meadows between the aspen clumps. The prairies there too are not often burned as south of the Qu'appelle, the valley of that river serving as a great barrier to prevent the onward progress of the devastating fires.

In present-day Alberta, the Red Deer River flows out of the Rocky Mountains in a northeasterly direction, turning abruptly and flowing south and southeast. In this latter stretch, along the east side of the Red Deer, are the Hand Hills. Here, during February of the year 1793, Fidler (MacGregor 1966:82) saw amazing numbers of bison that he was sure " . . . numbered some millions . . . as no

ground could be seen for them in that compleat semicircle and extending at least 10 miles . . ." Ten days later he was still in the midst of vast herds crossing the river to the west. Steele (1915:87) says, the same was true of this area in the winter of 1875, "to the south between Buffalo Lake and the Hand Hills, vast numbers of buffalo covered the country . . ."

Grinnell's (1962:234; 1970:274) Blackfoot informants corroborated Fidler's earlier observations that the flanks of the Rocky Mountains supported large herds of bison in winter. According to Grinnell (1962:234):

Then they always had plenty of buffalo--if not fresh meat, that which they had dried. For in winter they would kill large numbers of buffalo, and would prepare great stores of dried meat. As spring opened, the buffalo would move down to the more flat prairie country away from the pis'kuns. Then the Blackfeet would also move away. As winter drew near, the buffalo would again move up close to the mountains, and the Indians, as food began to become scarce, would follow them toward the pis'kuns. In the last of the summer and early autumn, they always had runners out, looking for the buffalo, to find where they were, and which way they were moving. In the early autumn, all the pis'kuns were repaired and strengthened, so as to be in good order for winter.

Therefore, the work that went into the construction and annual repairs of the pounds and/or pis'kuns was not wasted because bison herds most often returned annually to their wintering localities where they could be depended upon to remain until they were hunted out of the area.

Studies of the seasonal movements of modern bison herds support those historical accounts that favour seasonal movements due to changes in the availability and type of pasturage. In Wood Buffalo National Park, Soper (1941:380) regarded the "so-called

migration" to be of relatively small extent and, " . . . more in the nature of local seasonal movements from one type of pasturage to another, in many cases involving only short distances." He added:

By far the greater number of bison execute two distinct seasonal movements, varying somewhat in time and length. These occur alternately spring and fall, to and from the uplands of Alberta Plateau, and the plains and prairies west of Slave River, respectively. Motivation centers on the supply and accessibility of forage as reflected in summer and winter conditions.

The movement bears no direct or essential relationship to climatic conditions, elevation, or orientation.

Return movement to the summer range occurs at the end of winter, which in Wood Buffalo National Park persists into April. Although the principal movement occurs in late April or early May, a close study of bison movements by Soper (1941:384) indicated much earlier initial movements, the third or latter week in February, becoming progressively more noticeable in March.

Spring and fall movements were noted by McHugh (1958:13) who observed that in Yellowstone National Park where winter lasts from October-November through April-May:

The Lamar Herd moved each year about 10-25 miles from meadows at 8,000-9,000 feet to the lower Lumar Valley at 6,500 feet with the advent of fall snows. It returned to the higher meadows again with the disappearance of snow in May or June.

The Henry Mountain Herd followed a similar pattern, moving into winter range in September and returning to the summer range in May-June, a movement varying from eight to fifteen miles each way (Nelson 1965:24-29).

In the large Wood Buffalo National Park where the movements of bison are unrestricted, Soper (1941:384) reported that some herds

travelled only five or ten miles to reach their winter quarters, while others in remoter parts of the summer range travelled 150 miles or more, to reach winter pasturage.

Evidently the same herds, were observed by Soper (1941:380) during the winter in the same extensive meadows and plains for months at a time or as long as food was available. Since the choicer tracts were lush and seldom exhausted, the bison remained in these localities throughout the winter.

The Henry Mountain Herd, also more sedentary on their winter range, remained in one general area up to a month at a time (Nelson 1965:24).

The sedentary proclivities of bison in winter have historical documentation as well. Grinnell (1904:143-146) related that a company of U.S. Army Infantry was camped near Fort Hays, Kansas, in the fall and winter of 1866-67. A herd of eight or nine hundred bison remained nearby providing meat for the company from October 16, 1866, until April 20, 1867, when they were scattered by the arrival of the 7th Cavalry under the command of General George A. Custer.

According to Cahalane (1947:75), bison are more sedentary in winter but also, " . . . seem more gregarious and have a tendency to form larger herds." Soper (1941:380) noted also that resident herds south of the Peace River were augmented in late fall or early winter by an influx of bison from the north totalling between 400 and 500 animals. However, several small herds of about 40 bison wintered separately in nearby localities. In the Henry Mountain Herd, Nelson (1965:22) reported that "the herds during the winter

months were somewhat larger than those found in the summer season."

Soper (1941:380) attributed the tendency of bison to form larger sedentary herds in winter to their attraction to localities favoured with lush vegetation.

Therefore, not only did the individual herds tend to become larger during the winter, but the autumn influx of bison herds into the wintering areas formed the large aggregate herds that wintered in those areas of lush or available vegetation. The very large herds observed by Fidler (MacGregor 1966:82) along the Red Deer River in January of 1793, and the "incredible numbers" of bison observed by Henry (Henry & Thompson 1965:167) in January of 1801 in southwestern Manitoba, may be considered examples of aggregate herds that formed in certain localities and regions of the plains in winter and also in other regions during the summer (Hind 1971:107-109 and 339-340).

CHAPTER IV

BISON HUNTING METHODS OF THE NORTHERN PLAINS INDIANS

Introduction

All Indian tribes on the Plains hunted the buffalo, and according to Dodge (1882:576), "The pursuit of the buffalo was, after war, the noblest excitement of the Plains Indian." In fact, added to their other intertribal conflicts, northern Plains tribes, the Crow, the Blackfoot, Assiniboiné, and Sioux, were continually at war in early historic times with tribes from west of the Rocky Mountains over the possession of the buffalo (DeSmet 1905:4:1375).

The Plains Indians possessed a number of methods for hunting buffalo. One way was for single individuals or small groups, during all seasons, to stalk these animals on foot, and by strategems, approach downwind close enough to kill them in small numbers. Stalking was practiced at all seasons of the year.

Co-operative hunts often involving the whole band or community were practiced by all Plains tribes. Most common was to surround the buffalo, and by slowly closing in, or firing the encircled area, get close enough to kill them. A variation of the surround, the bison drive, was widespread on the northern Plains and of great antiquity. The bison were herded and enticed from considerable distances only to be stampeded at the last moment into corrals of wood, over cliffs, or into box canyons.

From the Spanish Southwest, the diffusion of horses in great numbers to the northern Plains after ca. 1740 (Ewers 1955:332) gradually changed Indian hunting practices. Equestrianism increased the hunting mobility of the Plains Indians. In time, the surround of buffalo on horseback and the chase with horses gradually replaced the traditional jumps and pounds. However, among the northernmost Plains tribes, including the Northern Blackfoot, Assiniboiné, Cree, and Gros Ventres, the lack of horses forced them to continue to rely upon the traditional drives.

Stalking

Stalking of game animals wherein an individual or several hunters cautiously approached close to the animals and then killed them is probably the most ancient way of all to hunt.

On the northern Plains, an Indian with bow and arrows would kill six or more buffalo without detection (DeSmet 1905:4:1398). Later, the hide hunter with a good rifle and a dead-eye could eliminate a small herd. However, the Plains Indian developed the method to perfection preferring the bow and silent arrows.

Horses were not used in stalking. The approach required caution and stealth and was always to the leeward of the herd, however light the wind, in deference to the bison's keen sense of smell (Kane 1968:268; DeSmet 1905:4:1398). According to Denig (1930:534), the slow and laborious approach sometimes required hours to get within shooting distance.

At those seasons when the grass was up, the bison were more easily approached in the middle of the day when they were lying

down for an hour or two and, if not asleep, their range of vision was reduced by that position and the intervening grass (Denig 1930:539).

When the terrain was too level for close approach or the bison were suspicious, a disguise was necessary. This was most often a wolf skin tied on at the waist and neck (Grinnell 1962:234). The buffalo paid little heed to something so familiar. Sometimes, a "close dun-coloured cap, furnished with upright ears" was used to give the appearance of a wolf (Simpson 1843:404). At other times the hunter covered his head with sage brush or stuck grass in his belt. However, Denig (1930:534) considered it indispensable to wear a skin dress in summer and a white blanket coat over it in winter or else a buffalo robe coat with all the hair turned inside. According to Denig (1930:534-535), bison were attracted more by dark coloured clothing than light, and a wolf skin was decidedly the best disguise when hunting any of the animals on foot. If the bison became suspicious during his approach, the hunter, covered with his wolf skin, would stop and howl like a wolf.

The Assiniboine preferred the bow and arrow for the kill although the gun was available (Simpson 1843:405). However, the gun was also used (Denig 1930:534). According to Grinnell (1962:234), the Blackfoot also preferred the bow and arrow. In winter, the gun was used for stalking buffalo and only the choicest cows were selected (Simpson 1843:404). Hood (1967:11) tells of the Chipewyans creeping under the snow to approach game using guns for the kill. Franklin (1970:114) was impressed by the hardihood of Indian hunters

around Carlton House, who, when necessary, crawled in the snow for an hour or longer, sometimes with the temperature at "30^o to 40^o below zero," to kill two or three buffalo out of a herd.

Buffalo and antelope were slain when the snow drifted into the gullies, forming banks 10 to 15 feet deep. The animals were pursued on foot with snowshoes (Denig 1930:535). According to Simpson (1843:405), the alternate freezing and thawing of the snow in spring produced a hard crust that would hold a man on snowshoes but yield to a buffalo's weight.

Under these circumstances the bison were frequently run down by the hunters and stabbed with daggers.

Although the method of stalking bison was necessary to provide the individual Indian hunter with necessary food at any time, this most ancient hunting method was basic and necessary in the initial phase of the surround and of the bison drive. Stalking, combined with decoying techniques described by Denig (1930:535) as " . . . a rare talent," enabled the Indians to gradually develop the surround and the bison drive.

Surrounding

In prehistoric times, the surrounding of bison and other animals was practiced throughout North America. On the northern Plains, all of the tribes that depended on the bison practiced the surround.

Among the earliest descriptions of surrounds were those of Perrot (Blair 1911:121-122) and Hennepin (1880:143) in the upper

Great Lakes country among the "Illinois" and Miami Indians during the latter part of the 17th Century.

Perhaps the first European to witness a surround in Canada was Henry Kelsey (1929:13), somewhere along the Saskatchewan or Carrot River prairies, on August 23, 1691. The hunting group may have been Saulteaux, Crees, or Assiniboine. Kelsey (1929:13) described the experience as follows:

This instance (that is today) ye Indians going ahunting Kill'd great store of Buffillo. Now ye manner of their hunting these Beast of ye Barren ground is where they see a great parcel of them together they surround them with men wch done they gather themselves in a smaller Compass Keeping ye Beast in ye middle & so shooting ym till they break out at some place or other and so gett away from ym.

According to Grinnell (1970:280), the Blackfoot sometimes found a herd in a favourable position with no wind blowing. If the camp was large they would then set up their lodges all about the buffalo, wherein the chance of a successful surround was greatly increased. An aged Blackfoot informant named Weasel Tail described to John Ewers (1960:45-46) a surround in pre-horse days as follows:

After swift-running men located a herd of buffalo, the chief told all the women to get their dog travois. Men and women went out together, approaching the herd from down wind so that the animals would not get their scent and run off. The women were told to place their travois upright in the earth, small (front) ends up. The travois were spaced so that they could be tied together, forming a semi-circular fence. Women and dogs hid behind them while two fast-running men circled the herd, approached them from up wind and drove them toward the travois fence. Other men took up their position along the sides of the route and closed in as the buffalo neared the travois enclosure. Barking dogs and shouting women kept the buffalo back. The men rushed in and killed the buffalo with arrows and lances.

After the buffalo were killed the chief went into the centre of the enclosure, counted the dead animals, and divided the

meat equally among the participating families. He also distributed the hides to the families for making lodge covers. The women hauled the meat to camp on their dog travois. This was called 'surround of the buffalo.'

Grinnell (1892:130-134) hypothesized that before the introduction of the horse to the central Plains, bison were "called" or enticed into surrounds by the same technique that continued late in use in the traditional drives.

By the early 1800's, the practice of mounted hunters, usually in groups of fifty or more, surrounding herds of bison, became common on the northern Plains. The horse increased the Indian's mobility and extended the distance from camp that meat could be obtained and readily transported back to camp. As opposed to the traditional bison drives attendant with much religious activity, horse surrounds required little time or preparation and permitted the Indians to kill at least as many animals as they obtained in drives. The acquisition of the horse in considerable numbers plus the relative ease with which equestrian hunters could carry out a large slaughter were important factors in the increased use of the surround and the gradual demise of the traditional drives.

Each of the various hunting methods required certain favourable conditions with reference to weather, wind velocity and direction, general nature of the terrain, and the surface condition of the ground. In preparation for a bison surround, Dodge (1882:288) described the necessary conditions:

Other conditions being favorable, the camp is whenever possible, pitched in a broken country, for the favorite and most successful mode of killing large numbers is by 'the surround,' and this is only practicable when hill and hollows,

breaks and ravines render the approach to the herd easy, and prevent other herds from seeing or hearing the commotion and noise attendant upon its destruction.

Denig (1930:531) was also well aware of the conditions for success in his description of the approach to the herd:

Their march is conducted in silence, with the wind in their faces, consequently blowing the scent away from the buffalo . . . The animal is not quick sighted but very keen scented, and a man can, in passing across the wind blowing toward them, raise a herd at a distance of 2 or 3 miles, without their seeing him.

The party proceeds in their order, taking every advantage of concealment the country affords in hills, coulees, bushes, long grass, etc., endeavoring to get around them.

Among the tribes of the eastern prairies of Illinois and the upper Mississippi Valley the bison were reported to have been surrounded and hunted with the use of fire. Allen (1876:202-203) cited Du Pratz, Charlevoix, Hennepin, and others as giving very similar accounts of the Indians encompassing a herd of bison and then firing the prairie except for specific places left free to lie in ambush.

Except for those times when there was no wind, such a practice on the tall grass prairies would appear to have been exceedingly dangerous, due to the uncertainties of wind velocity, sudden changes in wind direction, and the intensity with which fires can burn on the tall grass prairie. However, during seasons of the year when the ground was damp, the fires would have burned slowly, with much smoke, and without danger to the Indians involved.

Chasing on Horseback

The chase after bison on horseback or "running buffalo" was

universal among buffalo hunting tribes on the Plains. During all seasons, for both Indian and white hunters alike, the chase provided meat and hides, and great sport as well. Success depended on an excellent horse and a brave rider familiar with his weapons. Indians generally preferred the bow and arrow to fire arms (Harmon 1911:285). However, after the Winchester repeating rifle came into use, Grinnell (1962:235) says, " . . . it seemed as if the different tribes vied with each other in wanton slaughter." Each member of the hunting party provided himself with two horses, one that he rode to the vicinity of where the chase began, and the other, expressly trained for the purpose, to be ridden during the chase.

According to Audubon and Bachman (1851:48), the Mandan chased the buffalo in parties of twenty to fifty hunters. DeSmet (1905:4:1376) mentioned that in a chase where he was present, " . . . upward to 600 buffalo were laid low by about 200 Flathead and Pend d'Oreille hunters." On the 20th of November, 1834, " . . . four or five hundred Indians (Crow) were mounted and ready for the Chase (Leonard 1959:144)." As Ewers (1955:305) pointed out, however, "It could be employed by a single hunter or the men of an entire village."

On the discovery of a buffalo herd, Hornaday (1889:471) reported that the hunters:

Usually got to the leeward of it and quietly rode forward in a body, or stetched out in a regular skirmish line, behind the shelter of a knoll, perhaps, until they had approached the herd as closely as could be done without alarming it. Usually the unsuspecting animals, with a confidence due more to their great numbers than anything else, would allow a party of horsemen to approach within from 200 to 400 yards of their flankers,

and then they would start off at a slow trot. The hunters then put spurs to their horses and dashed forward to overtake the herd as quickly as possible. Once up with it, each hunter chooses the best animal within his reach, chases him until his flying steed carried him close alongside, and then the arrow or the bullet is sent into his vitals. The fatal spot is from 12 to 18 inches in circumference, and lies immediately back of the foreleg, with its lowest point on a line with the elbow.

Often a horse or rider was gored, but the primary danger stressed by Colonel Dodge (1959:127) arose " . . . from the fact that neither man nor horse can see the ground, which may be rough and broken or perforated with prairie dog or gopher holes . . ." into which the horse might step. The dangers of the chase with reference to the terrain were exemplified in the descriptive example by Alexander Ross (1957:257) in which 400 riders participated with near fatal consequences:

On this occasion the surface was rocky and full of badger holes. Twenty-three horses and riders were at one moment all sprawling on the ground; one horse, gored by a bull, was killed on the spot; two more were disabled by the fall; one rider broke his shoulder blade; another burst his gun and lost three of his fingers by the accident; and a third was struck on the knee by an exhausted ball.

Alexander Henry (Henry & Thompson 1965:176), running buffalo on April 29, 1801, apparently enjoyed the chase, " . . . but the ground being slippery my horse fell, and I cut my head on the cock of my gun."

According to Denig (1961:160), the Crow used the chase on horseback all winter unless the snow became too deep to catch the buffalo. Simpson (1843:404) also reported that:

When the snow is not deep the buffaloes may be run on horseback as in summer; indeed, if numerous, they beat such a track with their broad hoofs that they are easily pursued . . .

Grinnell's (1962:235) friend, Hugh Monroe, a Blackfoot, related to Grinnell that when the ground was full of holes and washouts, and chasing the buffalo on horseback was dangerous, it was then that he utilized his skill at stalking, and using a bow and arrows, usually shot a few bison without alarming them.

According to Howell (1944:76), ungulates, especially the more gregarious ones, like bison, tend to follow a leader blindly, often with disastrous results. They also exhibit a great fondness for racing parallel with other fast moving bodies and, when racing, reveal a strong propensity to cross in front of the other body.

This particular behaviour has been described in the historical literature during the latter days of the Cree pounds and the hunts of the Red River Metis. For example, Paul Kane (1968:80) described it as follows:

A man mounted on a fleet horse, usually rides forward till he sees a band of buffaloes . . . the man now rides up alongside of the herd, which from some unaccountable propensity, invariably endeavor to cross in front of his horse. I have had them follow me for miles in order to do so. The hunter thus possesses an unfailing means, wherever the pound may be situated of conducting them to it by the dexterous management of his horse.

The same bison behaviour was reported by Grinnell (1962:232-233) as described to him by his friend, William Jackson, who observed it during a bison drive by Red River Metis in the spring of 1881.

The men kept about half a mile from the herd, and up even with the leaders. As they ran, the herd kept constantly edging a little toward the riders, as if trying to cross in front of them. This inclination was least when they were far off, and greatest when they drew nearer to them. At no time were the men nearer to the herd than four hundred yards. If the bison

edged too much toward the riders, so that the course they were taking would lead them away from camp, the men would drop back and cross over behind the herd to the other side, and then, pushing their horses hard, would come up with the leaders,--but still at a distance from them,--and then the buffalo would begin to edge toward them, and the herd would be brought back again to the desired course. If necessary, this was repeated, and so the buffalo were kept travelling in a course approximately straight.

This same ungulate propensity was described briefly by Jefferson (1929:92), and later mentioned by Mandelbaum (1940:191) among the Plains Cree, who often took advantage of this behavioural trait in the latter days of their bison drives into pounds. This drive technique was reported only among the Red River Metis and the Cree. Apparently, it came into use late, and had no effect on the traditional drives of the Blackfoot, Assiniboine, or the Gros Ventre.

Bison Drives

Introduction

On the Great Plains, the earliest known occurrence of a bison drive occurred at Bonfire Shelter in southwest Texas over 10,000 years ago (Dibble & Lorrain 1968). Successive drives of bison over a cliff were carried out, after which, the site was abandoned until 2,600 years ago, when bison again thundered over the same cliff to their destruction.

Nearly contemporaneous with Bonfire Shelter, the Olsen-Chubbuck Site (Wheat, 1972), in southeastern Colorado, demonstrated that several hundred people, cooperatively, could take advantage of fortuitous circumstances to drive nearly two hundred bison to their deaths over a cutbank into an arroyo.

The geographic area over which bison drive sites are distributed has been delineated (Malouf & Conner 1962). Drive sites occur east of the Rocky Mountains in Canada and south of the aspen parkland fringe in the prairie provinces of Alberta, Saskatchewan, and Manitoba. South of the Canadian border, drive sites occur in all of the Great Plains states, with the possible exception of Kansas. They are found also in the state of Washington, in southern Idaho, and possibly Utah.

Montana, east of the continental divide, is regarded as the centre for drive sites. Their greatest concentration is in Montana, Wyoming, Alberta, and Saskatchewan, mostly on the short grass plains.

Buffalo jumps and pounds appear to be scattered unevenly over the northern Plains. Jumps are found in far greater numbers than pounds along the foothills and flanks of the Rocky Mountains, whereas, pounds are much more common than jumps farther eastward on the more level plains and prairies. The factor of terrain and the availability of timber and brush would certainly be important in determining whether a jump or a pound would be used. However, different cultural traditions may have been equally important.

As horses became available, the chase on horseback and the surround by mounted hunters became the favourite ways to hunt. Buffalo jumps finally fell into disuse on the northern Plains between 1840 and 1850 (Malouf & Conner 1962:53), and the last known use of a bison pound was among the Blackfoot, about 1873 (Ewers 1949:360).

The Buffalo Jump

The earliest historic account available of a bison drive is that of Mathew Cocking, a Hudson's Bay Company trader, who visited

Gros Ventre pounds and recorded the pounding of bison throughout the severe winter of 1772-73. Peter Fidler, another Hudson's Bay Company trader, wintered among the Piegans and Bloods in southern Alberta and witnessed their drives, both jumps and pounds, throughout the autumn and mild winter of 1792-93 (Forbis 1960:63-64; MacGregor 1966:68-70).

Alexander Henry, the younger, described the bison drives among the Piegan, North Blackfoot, and Assiniboiné, and camped at the base of "Kootenay Parc" in the Rockies where the Kootenay reputedly ran bison over a precipice.

Farther south, Dodge (1882:291) wrote that the Sioux "decoyed herds into position and drove them over precipices" and the Pawnees made "quasi-surrounds" into which immense numbers of bison were driven over precipices (Dodge 1882:577). Hornaday (1889:483) quoted a T.R. Davis as stating that the Indians between the Platte and Arkansas Rivers were seen by him driving buffalo over "ledges."

In a footnote, Wissler (1910:49) reported that a Mr. Resse Kinkaid,

In talking to Washee, one of the Arapaho chiefs, about this matter, he said he remembers seeing the Arapaho hunters drive a herd of buffalo over a bluff in Colorado . . . George Bent, a Cheyenne, says that in the winter of 1872, he saw the Indians drive a bunch of buffalo over a bluff in the Cimarron River of Oklahoma and that many were killed.

Among the Crow, herds of some hundreds of buffalo were driven over a cliff (Leonard 1959:144). Recently, Medicine Crow (1962:36-38) described a number of buffalo jumps formerly used by the Crow and outlined the Crow bison drive procedures. Among the Cheyenne, Grinnell (1962:230) referred to their bison pounds as often built

of brush. Occasionally, two tribes used the same drive site. For example, a Crow jump on the Tongue River was also used by the Cheyenne (Medicine Crow 1962:48). In southern Idaho, a buffalo jump reported by Butler (1971:4-32), was most likely in use by the Lemhi Shoshoni around 1840.

Among the Blackfoot, the terminus of the drive was called "Pis-kun" or "deep-blood-kettle," and was described by Grinnell (1962:228-9) as follows:

This was a large corral, or enclosure, built out from the foot of a perpendicular cliff or bluff, and formed of natural banks, rocks, and logs or brush--anything in fact to make a close, high barrier. This barrier was usually 6 to 8 feet high.

Where the vertical cliff was high enough, no corral was necessary since the buffalo were killed or disabled by the fall. However, pis'kuns were most often built under low-cut bluffs (Grinnell 1962:232).

Grinnell (1962:230) referred to the pis'kuns of the Sik'-si-kaw or North Blackfoot as like those of the Cree, which were pounds, but different from those of the Piegiens and Bloods. Pis'kun, therefore, apparently referred to either jumps or pounds. Henry (Henry & Thompson 1965:725), more familiar with the North Blackfoot pounds, considered the Piegiens a lazy lot, declaring:

So much do these people abhor work that, to avoid the trouble of making proper pounds, they seek some precipice along the bank of the river, to which they extend their ranks and drive the buffalo headlong over it.

The enclosures, at least among the Piegiens, were not always circular, and one pis'kun measured by Fidler was some 50 yards long and 20 yards wide (Forbis 1960:64).

The height of the drop over cliffs or cutbanks varied. Fidler mentioned a " . . . fall that was perpendicular about 40 feet," and the kind of place in the Plains that was "very useful for the Indians where no wood is to be had to make one of" (MacGregor 1966:68). This height coincides with Frison's (1970b:5) estimate of the Glenrock Jump, " . . . which presented nearly a 40' vertical drop to a steep talus slope below." Very few jumps have a vertical cliff exceeding a height of 30 feet but below the cliff at many jumps, a talus slope often very steep, would continue the tumbling downward plunge of the unfortunate bison. Probably the record height for a jump was recorded by Lewis and Clark in 1805, where the bison had been driven over a precipice of 120 feet (DeVoto 1952:120).

A drive site consisted of a gathering basin or grazing area in the locality of the pis'kun where first contact was made with the buffalo. The animals were then gradually lured into a wide V-shaped path or drive lane delineated by drives lines or fences that converged at the edge of the cliff, cutbank, or pound entrance.

Along the foothills of the Rockies from Alberta and Wyoming, the drive lines of most pis'kuns were formed of piles of boulders up to three feet high which remain visible today but often are deeply imbedded in the sod. The availability of materials determined the nature of the drive lines. Fidler's account (Forbis 1960:63) spoke of fences consisting of piles of four to six pieces of dried buffalo dung piled up about knee high and called "dead men." Brush was also used when available (Grinnell 1962:229).

The distance between the two converging lines at the precipice

was much wider than the entrance to pounds. According to Fidler (Forbis 1960:63), the two lines of jumps were not more than 60 feet apart. However, at the Piegan jump on Two Medicine, Wissler (1910:34-36) reported the width as about 50 metres.

The distance between the individual stone piles or dead men in each drive line gradually increased as they extended away from the cliff and out onto the prairie (Forbis 1960:63; Wissler 1910:34-36). This was due to the need for a more solid barrier or fence nearer to the cliff since the danger here was greater that the bison might turn at the last moment before the plunge and escape, possibly injuring or killing the people manning the dead men. Wissler (1910:34-36) gave the distance between the piles at Two Medicine as three to seven metres and Fidler reports the dead men at the drives he witnessed as about thirty yards from each other. At the Emigrant Jump (Arthur 1962:16) the stone piles close to the cliff were about six feet apart with the distance between each pile increasing farther away from the cliff. At the Peterson Jump (Arthur 1966:51), the stone fences were nearly solid and in double rows for the last 100 feet approaching the cliff.

The length of the stone fences varied, and Wissler (1910:34-36) estimates that those on Two Medicine extended back from the bluff for about two miles leaving an opening at the mouth of the drive lines also one and one-half to two miles wide. Kehoe (1967:83), examining drive sites on the Blackfoot Reservation noted a complex of drive sites where "For miles back of these drop-offs are intricate systems of segmented rocklines formed of piling glacial

boulders in small piles about two or three feet in diameter and twelve to fifteen feet apart." Frison (1970a:7), describing the Kobold Jump, specified 86 visible stone piles extending about 1800 feet along the edge of the mesa and a lesser number converging nearer the jump-off.

The Bison Pound

Location. Once bison were discovered in a given area, the location of the pound depended primarily on the natural terrain and wind direction. The flat or gently rolling plains and prairies away from the Rocky Mountains eastward favoured the construction of pounds.

MacDougall (1896:273) says that pounds were usually situated on the south or east side of a gently sloping hill because timber grew there, the north and west sides being open country. Among the Assiniboine, Henry and Thompson (1965:518) noted, "This enclosure [pound] is commonly made between two hummocks on the declivity or at the foot of rising ground." Harmon (1911:285-286) also noted the importance of rising ground close to the entrance so that the pound could not be seen at a distance.

According to Dan Kennedy (Ochankugahe) (Weekes 1948:14), ingenuity and skill were necessary in making a buffalo pound and

The first step was a suitable location; that is, a place where there was a natural drop--as in a ravine--of about five feet, which was to be a 'jump-off' or entrance to the pound or trap. If such a natural terrain could not be found, an artificial drop was constructed.

Speaking of the Cree, Jefferson (1929:92) gave their requirements for a pound as, a suitable location, with bush handy, and the

lie of the land suitable. According to Weasel Tail, a Blood, who participated in pounding bison in winter among the North Blackfoot, "We built a corral near the edge of the timber toward the bottom of the slope"(Ewers 1968:166). MacDougall (1896:273) reported that the Cree had erected a pound "in timber just below the summit." The purpose, of course, was to prevent the bison from seeing the enclosure until it was too late to escape. At a pound that M'Gillivray (1929:43-44) visited, "The pound was so well constructed on the declivity of a small hill that it was invisible till you arrived at the gate."

Construction. The construction of a pound was considered a religious undertaking and the drive descriptions of DeSmet (1905: 3:1028-1029), MacDougall (1896:273), Weekes (1948:17), and others bear this out. According to Rodnick (1938:24), the Assiniboiné poundmaster was a medicine man or shaman with acquired powers that could make the buffalo appear when needed. Among the Plains Cree, the shaman chose the location of the pound and directed its construction and operation (Mandelbaum 1940:190).

Among the Assiniboiné, Cree, and North Blackfoot, pounds were described as round or circular. Exceptions were noted by Umfreville (1954:82), who described pounds as either "circular or square," and Jenness (1938:14-15), whose Sarcee informants described their pounds as rectangular in shape.

Pound construction was essentially the same among the different northern Plains tribes. According to MacDougall (1896: 273-274), the preliminaries to the erection of a pound by the Cree

were as follows:

This was done by chopping and clearing away the timber from a circular space--say one hundred, or one hundred and twenty-five feet in diameter. From this circle all the bush and trees, with the exception of one tree in the centre, were cleared out, and around this circle a strong fence of logs and brush was built, strong enough and high enough to hold the buffalo.

Referring to the Assiniboine, Denig (1930:532) says they

. . . cut timber and plant strong posts in the ground nearly in circular form and fill up the openings between with large logs, rocks, bushes and everything that will in anyway add to its strength.

Henry and Thompson (1965:18) commented that, " . . . trees are cut down, laid upon one another and interwoven with branches and green twigs." This was done to give the appearance of a solid wall (Weekes 1948:14). The importance of the appearance at least of a solid wall was described by Professor Hind (1971:357) after nearly two hundred bison had been driven into a pound:

One wary old bull, espying a narrow crevice which had not been closed by the robes of those on the outside, whose duty it was to conceal every orifice, made a dash and broke the fence, the whole body then ran helter skelter through the gap, and dispersing among the sand dunes, escaped.

Hind (1971:356) noted that the circular wall of the enclosure was braced by outside supports. The Assiniboine pounds were built with only one aperture left in the corral. "This was opposite the entrance for the buffalo and was only for the entrance and exist of the poundmaker" (Weekes 1948:14). Among the Cree and Assiniboine, a tree was left uncut in the centre of the enclosure or a pole was placed there as a medicine pole from which offerings were hung. The literature gave no indication that the North Blackfoot used the medicine pole in their drives.

Apparently from hearsay, Hood (1967:11), Kane (1968:81), and Simpson (1843:402), mentioned pounds constructed entirely of the bones of dead buffalo.

Since no two pound sites were identical, minor differences of pound location and construction reflected the ingenuity and skill of the poundmaster and those under his direction in building an effective structure utilizing to best advantage any given terrain and pound location.

Although Grinnell (1962:230-231) described the causeway leading into the North Blackfoot pound in detail, the best description of the enclosure was that of Weasel Tail (Ewers 1968:166) who described the one he helped to build. It was made of "cottonwood posts set upright in the ground to a height of about 7 feet, and connected by crosspoles of cottonwood or birch tied to the posts with rawhide ropes." An important innovation, apparently unique among the North Blackfoot was described by Weasel Tail as follows:

All around the corral stakes of cottonwood or birch were laid over the lowest crosspoles. Their butt ends were firmly braced in the ground outside the corral. Their other ends projected about 3 feet or more inside the corral at an angle so that the ends were about the height of a buffalo's body. These ends were sharpened to points, so that if the buffalo tried to break through the corral, after they had been driven into it, they would be impaled on the stakes (Ewers 1968:166).

The estimated height of the corral wall varied among different observers. Henry (1969:299) estimated the height to be "about four feet," whereas Kane (1968:80), and Henry (Henry & Thompson 1965:518), estimated the height as five feet. A height of seven or eight feet was estimated by Cocking (1908:109), Ewers (1968:166), and Grinnell (1962:230). Mandelbaum (1940:190) wrote that among the Plains Cree,

"the cut bush and felled logs were heaped up to make a wall ten to fifteen feet high." More reasonably, MacDougall (1896:273-274) described the Cree pound as simply "strong enough and high enough to hold the buffalo."

The different sizes of pounds is evident from the different estimates given by various firsthand observers. Among the Cree, Jefferson (1929:92) estimated the diameter of a pound as "thirty or so yards," conforming well with MacDougall's (1896:273) estimate of "100 to 125 feet in diameter," and with Hind's (1971:356) figure of "120 feet broad." Palliser (1863:70) noted the Cree pound he examined was "about 50 yards in diameter," whereas Franklin (1970:112) observed a large Cree pound "about one hundred yards in diameter." Assiniboine pounds also varied in size. According to Henry and Thompson (1965:518), the size of a pound depended on the number of tents in the camp. Weekes' (1948:14) Assiniboine informant concurred, stating: "The Trap was a circular area of from forty to ninety feet in diameter, depending on the size of the camp and the number of buffalo the hunters wished to entrap." Rodnick's (1938:23) informants also said that pounds varied in size according to the number camped together. The average size of an Assiniboine pound was about an acre according to Denig (1930:522), DeSmet (1905:3:1028) and Lowie (1910:11), although Henry (Henry & Thompson 1965:518) stated, "The common size is from 60 to 100 paces or yards in circumference" The pound that Kane (1968:80) observed enclosed about two acres whereas the Gros Ventre pound visited by Cocking (1908:109) was described as "a hundred yards in circumference."

The pound entrance. Construction of the pound entrance depended largely on what the terrain afforded. Where a natural drop of about five feet--as in a ravine--could not be found so as to provide a jump-off into the pound, then an artificial drop was constructed (Weekes 1948:14). The artificial drop varied in height from three feet (MacDougall 1896:274) to six feet (Palliser 1863:71), and was an inclined plane forming a ramp, bridge, or causeway upon which the bison were forced to run and jump into the pound. In the North Blackfoot pound described by Grinnell (1970:280), one point in the wall of the enclosure was cut away so that the height of the wall was only about four feet. Here was built a causeway of logs,

. . . covered with dirt, sloped by a gradual descent down to the level of the prairie. This bridge was fenced on either side with logs, and the arms of the V came together at the point where the bridge reached the ground (Grinnell 1970:280).

Grinnell's description agrees in all essentials with DeSmet's (1905:3:1028) account of an Assiniboiné pound wherein:

Stakes are firmly fixed in the ground, and the distance between them is filled with logs, dry boughs, masses of stone --in short, with whatever they can find that will answer the purpose. The circular palisade has but one opening; before this opening is a slope embracing fifteen or twenty feet between the hills: this inclined plane grows wider as it diverges from the circle; at its two sides they continue the fence to a long distance on the plain.

Use of the inclined plane was specifically referred to among the following tribes: Assiniboiné (DeSmet 1905:3:1028), Cree (Palliser 1863:71; MacDougall 1896:274; Mandelbaum 1940:190), North Blackfoot (Grinnell 1962:230; Ewers 1968:167), and Sarcee (Jenness 1938:16). The entrance to the Cree pound observed by

Franklin (1970:12), " . . . was banked up high enough with snow to prevent any retreat once they [bison] entered," thereby utilizing the inclined plane principle but in a different medium.

Cocking's description of a Gros Ventre pound, within the details given, conforms to Wissler's (1910:49) "Assiniboine type" or pound used by the Assiniboine, Cree, North Blackfoot, and Sarcee. According to Cocking (1908:109), the entrance to the Gros Ventre pound was "on the side of a hill where animals can easily go but cannot get out." Although the inclined plane is not mentioned specifically in this instance, the Gros Ventre certainly knew of its use from observation and association with neighboring tribes and they most likely used it extensively in their own pounds.

Pounds built in a copse of poplars on level ground or at the base of a gentle slope definitely required some means to prevent the bison from retreating out of the pound. However, the inclined plane or ramp was not the only technique used by northern Plains tribes for constructing the pound entrance.

In Hind's (1971:358) eye-witness account of a Cree drive into a pound he states,

At the entrance to the pound there is a strong trunk of a tree placed about a foot from the ground, and on the inner side an excavation is made sufficiently deep to prevent the buffalo from leaping back when once in the pound.

Unique in the literature, this log and pit technique was used "in a pretty dell between sand-hills" (Hind 1971:357), probably on level ground or a gentle slope.

The width of the pound entrance varied but MacDougall (1896: 274) and later Mandelbaum (1940:190) estimated the width of Cree

pounds as about twenty feet. Harmon (1911:285-286), speaking of Plains Indians in general also estimated the entrance to be "about twenty feet broad." The Assiniboine pound entrance according to DeSmet (1905:3:1028) was about fifteen to twenty feet wide, whereas Henry and Thompson (1965:518) describe it as "about ten paces wide." According to Dan Kennedy, (Weekes 1948:14-15), a knowledgeable Assiniboine informant:

The 'mystic' dimension of the entrance for the buffalo was usually seven paces wide or the length of two flint dried buffalo hides which curtained the entrance. The width of the opening was about 21 feet. The flint or dried buffalo hides made a rattling noise which kept the buffalo from going near it once they were in the pound.

The Cree also curtained off the entrance when necessary, for with the bison immediately in the pound, "the door or gap was suddenly filled by a solid line of men, who pulled their robes before them, and stood without a move as the mad herd settled into a gallop around the pound" (MacDougall 1896:274). According to Henry (1809:295), skins were "let down by strings to stop the entrance as soon as the bison were inside," and no mention was made of a ramp. In Weasel Tail's account (Ewers 1968:167), and since it was winter, the ramp was covered with manure and water that quickly froze and became slippery, thereby preventing any retreat of the bison from the pound.

Somewhat surprising was Dr. Hector's account of his visit to a Cree pound (Palliser 1863:71) where despite the fact that the bison were forced to jump about six feet from the ramp into the pound which was on a slope, it was necessary on the upper part of the enclosure to use skins stretched on poles to increase the height

to hold the bison.

The drive lines.

The ramp was fenced on either side with logs to ensure the bison's entrance into the pound and the . . . fences of the V came together at the point where the bridge reached the ground (Grinnell 1970:280).

The drive lines were constructed of whatever materials were available including brush, buffalo dung, logs, rocks, sticks, stakes, tree roots and heaps of snow or dirt.

Close to the pound entrance the drive lines were nearly a solid fence since this was where the danger was greatest during the drive, or as Jefferson (1929:92) says, "This was a critical point and the fences were strongly built." MacDougall (1896:274) also says that "From the entrance on either side a strong bush and log fence was run out . . ." This fence extended out a hundred yards or more (Henry and Thompson 1965:518-519; MacDougall 1896:274). At the end of the fences the appearance of solidity became less necessary and spaced individual piles of buffalo dung, stones, or "bundles of willows were placed on end at regular intervals for a mile or more" becoming the "dead men" or "watching waiters" behind each of which an Indian would lay hidden to stampede the bison into the pound (MacDougall 1896:274).

Henry and Thompson (1965:519) stated that these drive lines "extended on the plain for about two miles, and double rows of them are planted in several other directions to a still greater distance." These additional lines would give an obvious advantage by permitting a particular drive to continue despite shifts in wind direction, or would make it unnecessary to construct drive lines later when new

herds were discovered in different directions from the pound, usually to the west or north. According to Hind (1971:358), the drive lines extended as far as four miles into the prairie. The distance between the two lines at the extremities was often two miles.

Unequivocally, people lay hidden behind the individual piles or stakes during the drive. According to Larpenteur (1962:410), the individual positioning stations were made "either of snow or buffalo chips, gathered at intervals into small heaps sufficiently large to conceal a person." McDonnell (1960:279-280) noted that the drive lines were formed of "tufts of bushes and other obstacles stuck up in the snow or ground to hide a person behind it from the buffaloes, and thus every man, woman and child in the camp have their stations." Harmon (1911:286) described these "stakes" as "about four feet above the ground and about forty feet apart." Describing Assiniboine drive lines, Denig (1930:532 & 534) says,

They are thrown up piles of earth, about three feet high . . . large enough to conceal a man lying behind them . . . about 18 paces apart and extend in angles to the distance of a quarter to half a mile in proportion as there are people to man them . . .

When there is a deficiency of people to man the angles they are made by placing the lodges of the camp in that form, but this can only be done when they have a dozen or two of fast horses to extend the angle of the lodges and force the buffalo within the lines. This is also done, but it does not succeed as well as the way described.

Often, near the pound entrance the fences formed a narrow lane, so designed "that a sharp turn . . . hid from the frightened animals the trap that was prepared for them" (Jefferson 1929:92). Mandelbaum (1940:190) also described and illustrated this "elbow" turn in use among the Cree although MacDougall's (1896) detailed description made no mention of it. Archaeological evidence supports

the use of the sharp turn in some bison drives. Apparently the sharp turn near the drive terminus was not uncommon, note the Small Emigrant pound (Arthur 1962:22), the Keogh Buffalo Jump (Conner 1962:8) in southern Montana, and the Ruby Site (Frison 1971) in the Powder River Basin of Wyoming. Archaeologically this kind of information depends on the permanency of the drive lines which may be obtained only when the individual piles were heaps of stone.

At the Ruby site, Frison (1971:77) found that,

At a distance about 40 feet from the enclosure, the drive lane takes a sharp bend which obscured the pound from view of the animals until the last possible moment.

At the beginning of the bend, the two lines of post holes were eight feet apart and widened to a maximum of eleven and one-half feet (Frison 1971:77).

An Assiniboiné Bison Drive

Alexander Henry, the younger, (Henry & Thompson 1965:518) considered the Assiniboiné the most expert among the Northern Plains tribes in constructing and using bison pounds.

Recourse to the use of pounds was necessary for tribes like the Assiniboiné and Plains Cree who were often poor in horses or when they had no horses capable of pursuing the bison.

Among all Northern Plains tribes, the whole drive operation was in the charge of a poundmaster, or shaman. For example, the Assiniboiné poundmaster belonged to the Wah-kon or medicine band and was a distinguished personage (DeSmet 1905:3:1028). Selection of the pound site, construction of the pound, and the execution of the drive was planned and managed by the poundmaster, who through

his supernatural powers was believed to cause the buffalo to appear whenever needed (Denig 1930:532; Rodnick 1938:24).

After the pound and drive lines were constructed, between two and six young men or "runners" (Rodnick 1938:25) were sent out on foot by the poundmaster to scout the country for bison, occasionally going forty or fifty miles from the camp (Forbis 1960:63-64). Meanwhile, the Assiniboiné poundmaster commenced his ceremonial activities that included, among the Assiniboiné and Cree, the erection of a medicine pole in the centre of the pound, unless a tree had been left there to serve that purpose when the pound was constructed (Denig 1930:532). Offerings were attached to the pole or tree, high enough not to be touched by the bison. No central medicine pole was mentioned in use among the North Blackfoot or Gros Ventre.

Weekes' (1948:14) informant, Dan Kennedy, said that either a magpie or raven, both meat eating birds, was suspended from the tree. However, Denig (1930:532-533) described in some detail the pole and offerings:

A flagstaff or pole is planted in the center of the park, to the top of which is attached a yard or two of scarlet cloth, some tobacco, and a cow's horn. This is a sacrifice to the wind. At the foot of the same are placed two or three buffalo Heads which are painted red, decked out in feathers, and new kettles with scarlet cloth and other things placed before them. These are given to the Buffalo Spirits.

All newly constructed pounds were dedicated by a sacred and elaborate ceremony lasting four days and nights, invoking success for the pound. The preliminary rites of the dedication took place in the poundmaster's lodge (Weekes 1948:15). In this connection Denig (1930:533) noted:

Another Head painted and decked very gaudily is placed in the lodge of the master, who smokes and invokes it, at times singing the Bull Song, which he accompanies with a rattle nearly all night, and prophecies as to their appearance of success in the morning.

A more detailed account was given by Weekes' (1948:15-16) informant, Dan Kennedy:

At the time of the poundmaking, two buffalo teepees were set up, facing the setting sun, to which the poundmaster addressed the invocations, "Wee-yogh-peyam Tatanka-num-teepee-no" (Sun-setting-towards-buffalo-two-teepees). This was a plea for the success of the undertaking.

Here objects of veneration were exposed. They were a buffalo head, symbol of the presiding Manitou of the buffalo, and the raven or magpie, whose help was invoked for the success of the buffalo pound as they were allies of the undertaking, being carnivorous and depending upon meat. The sacrificial offerings were placed near the objects of veneration. These consisted of from two dozen to one hundred peeled fruit tree (saskatoon or other fruit) sticks, about eighteen inches long. Half of these were painted red, the other half were painted yellow. A number of these sticks were sacrificial offerings of sweat baths, a religious rite, the delight of the Manitou, to invoke his aid in the projected hunt. The greater number of these pledges, however, were simple sacrificial offerings.

According to DeSmet (1905:3:1029), the runners reported daily to the poundmaster their true observations, and when bison were discovered, they told him the distance the bison were found from camp, their probable numbers, and their direction of movement. The runners carried with them a Wah-kon ball (medicine ball) made of buffalo hair and covered with skin, entrusted to them by the poundmaster. When conditions were judged right to commence the drive, one of the runners was dispatched to carry the Wah-kon ball and the news to the poundmaster.

An important condition for the drive was wind direction, which had to be favourable before the drive began (Henry & Thompson 1965:519), and was most favourable when it blew directly toward

the pound from wherever the intended victim herd was located (DeSmet 1905:3:1029-1030). With the wind "aft" or behind them the runners could then direct the buffalo with great ease (Henry & Thompson 1965:519).

With the commencement of the drive the task of the runner shifted from locating and observing the bison to the more difficult and tedious work of manoeuvring the herd near the mouth of the drive lines leading to the pound. When the bison were located forty to fifty miles from the pound, the runners, who were always on foot, sometimes required three or four days and nights to bring them near the drive lines. This work required great patience because the herd had to be started by slow degrees and was done by setting fire to dung or grass (Henry & Thompson 1965:519). These fires were not conflagrations, but were kept well under control to produce smoke which would carry to the bison herd. The purpose of this activity was described by Dan Kennedy (Weekes 1948:16):

The buffalo driver manoeuvred the herd by directing smoke in their direction, being careful to keep out of sight. The smoke he contrived by keeping alight with dried buffalo chips the burning ember--a piece of wood--which he carried. There were no matches in those days and flint was used to kindle fires. He was careful to keep in a position where the wind would waft the smoke toward the buffalo and send them moving in the direction of the "Was-a-tomp," or mouth of the pound. It was extremely important that he keep to windward of the moving buffalo.

The invocation ceremony continued in the camp. If everything went as scheduled, with the wind favourable and the bison moving into proper range of the drive lines, then on the fourth night, before dawn, the buffalo caller began his very special part of the drive activity. The Assiniboine caller,

. . . whose name was Toka-Ki-He-Kuna (He Who Comes First) left quietly to join up with his brothers, the buffalo, where they roamed and fed. After the poundmaster himself, Toka-Ki-He-Kuna was the most important man in the undertaking; as the success of bringing in the buffalo depended upon his subtlety and cunning. 'He-Who-Brings-Them-In,' he was called (Weekes 1948:16).

After the buffalo caller had left, the poundmaster entered the pound through the aperture at the rear of the pound, taking with him his sacred objects. Placing himself near the rear of the pound and facing the medicine pole and the pound entrance, the poundmaster

. . . continued with his invocation, sitting near these objects of veneration and the sacrificial offerings. He filled the sacred pipe with kiniknik (Indian tobacco) and incensed it over burning sweet grass. Then, holding it aloft, he offered the smoke to the Great Manitou, invoking his intercession for a successful poundmaking.

The mystic rattler was then incensed. It was made of "rawhide in the shape of a gourd" . . . Standing with it in his hand, the poundmaker began to chant the mystic canticles or call for his brothers, the buffalo, "invoking the two 'tatanka' deities towards the setting sun," keeping time with his rattler to the rhythm of his chant until he was warned of the approach of the herd. When the herd approached the "jump-off" he left. All poundmakers did not have the same religious ceremonies in connection with their work. White Raven (Kanghiska, caused himself to be "suspended from the centre-post in a sort of hammock or swing made of buffalo thongs and from this hammock he chanted for his brothers, the buffalo, to come" (Weekes 1948:16).

A sentinel on some elevated spot notified the camp when the buffalo appeared and every man, woman, and child ran to man the dead men or drive lines (Henry & Thompson 1965:519).

Both DeSmet (1905:3:1030) and Denig (1930:533) described the caller riding a horse, "the best courser in the camp," upon which he covered himself and part of his horse with a buffalo hide and approached within 100 to 150 yards of the herd. Attracting the buffalo by using the plaintive cry of the calf, he induced them to

move toward him while he maintained his distance and continued drawing the herd within the drive lines.

Kurz (1937:146), has given an excellent description of this part of the Assiniboine drive with the caller on foot.

The crafty hunter moves slowly, never hurries. If he make but one bungling movement he may betray himself, startle the animals, cause them to take flight, spoil the hunt, expose himself to ridicule, and lose his reputation as skilled and practiced huntsman to whom only this most difficult undertaking might be entrusted. Not every one possesses that exact knowledge of the ways and habits of buffaloes, the exceeding cleverness in imitating them, or the craft and courage to expose himself to their horns and hoofs which insures success in ensnaring a herd. As soon as the foremost bison have come near enough to the narrow opening leading into the enclosure to bring the entire drove between the two barriers, then hunters on horseback as well as swift runners reveal themselves in the rear to cut off retreat and by their presence to keep the animals moving forward. Not until the disguised hunter has reached the "medicine pole" in the centre of the park, has presented his buffalo hide as offering and suspended it there along with other decorations and painted objects, does the commotion and noise begin.

The caller then left the pound through the same aperture used by the poundmaster.

The men at the rear of the herd drove the animals with all possible speed into the only open direction--between the narrowing lines leading into the pound. As the frightened buffalo caromed from one side of the drive lane to the other they were confronted by foot hunters manning the dead men (Denig 1930:533). Each hunter bobbed up alternately behind his station, waved his robe, and steadily moved the herd into the pound (Weekes 1948:17). Success at this stage depended mainly on the courage and skill of those manning the dead men because the herd could break out through the drive lines at any point and escape.

Once the herd was in the pound, the bison were affirmed always to run around it in a clockwise, east to west direction with the sun (Henry & Thompson 1965:519).

The ever-present fear that the herd might break out kept all noise hushed and the entrance to the pound was barred (Kurz 1937:146).

McDonnell (1960:280) described the finale of the drive wherein the poundmaster, after thanking the "master of life" for his bounty, offered the end of his pipe to the "chief" of the herd within the pound, saying:

My grandfather, we are glad to see you, and happy to find that you are not come in a shameful manner, for you have brought plenty of your young men with you. Be not angry at us; we are obliged to destroy you to make ourselves live.

The herd was then killed with arrows, lances and knives (DeSmet 1905:3:1031; Henry and Thompson 1965:518; Larpenteur 1962:410; Kurz 1937:146; McDonnell 1960:280), firearms being prohibited according to McDonnell.

After the slaughter was finished, McDonnell (1960:280) said the poundmaster distributed "a little swansdown, coloured in vermillion, upon each buffalo's head," and left every person at liberty to take what meat he thought proper.

The poundmaster must have the meat for his own use killed in the open field (McDonnell 1960:280). However, Henry (Henry & Thompson 1965:520) stated that "in the end he is always the best provided for; everyone is obliged to send him a certain portion . . .". Denig (1930:533) claimed that the poundmaster received no more than the others, his share consisting of all the tongues, plus other

payment or presents, and the prestige or standing of a divining man.

Horses were seldom used to bring buffalo to the pound from any distance, but were used to extend the drive lines. Once the buffalo were enticed by the caller into the mouth of the drive lines, the mounted hunters at the extremes of the lines closed together at the rear of the herd and stampeded it into the pound.

Among the Assiniboine, according to Henry (Henry & Thompson 1965:520):

Horses were sometimes used to collect and bring in buffalo, but this method is less effectual than the other; besides, it frightens the herds and soon causes them to withdraw to a great distance. When horses are used, the buffalo are absolutely driven into the pound but when the other method is pursued, they are in a manner enticed to their destruction.

CHAPTER V

THE SEASON OF THE HUNT

Grinnell (1892:130-134) advanced an idea on culture change and how a myth developed among the Pawnee. According to Grinnell, the Pawnee and Arikara, before they had horses, "called" the buffalo into surrounds of people or lodges just as the Blackfoot did before they had horses and continued to do so until about 1870. In fact, before the tribes of the northern Plains acquired horses, all of them secured most of their buffalo by means of pis'kuns and surrounds, and luring the buffalo into an enclosure or into a ring of people was universal among them (Grinnell 1892:132).

The Pawnee probably never built pis'kuns or anything corresponding to them, but there is no doubt that they decoyed bison into a circle of people (Grinnell 1892:133).

Since horses came from the south and the Pawnee had acquired them long before the Blackfoot, they had from that time always chased the buffalo on horseback. Therefore, the tribes who had earliest obtained horses were the first to abandon their former pedestrian methods of communally taking the buffalo. How they had decoyed the animals to their death might be long forgotten, but as Grinnell (1892:133) states:

. . . about the one remembered fact that the buffalo were called there would gradually grow up many details, supplied by successive narrators, which would add to the interest of

the story, and would tend to make the performance of the man who accomplished this wonderful act appear more and more marvellous.

Even after acquiring horses, the North Blackfoot continued to call the bison into the pis'kun until the latter part of the 19th century as did the Cree and Assiniboine. These latter Plains tribes, last to acquire the horse and generally poor in the number of horses they owned, were the last Plains tribes to give up their traditional and ancient methods of communal bison hunting.

Grinnell's (1892) hypothesis has merit when we consider that the horse was acquired by the Blackfoot sometime after the year 1725, and by other northern Plains tribes at about the same time (Ewers 1955:16-18). According to Anthony Hendry, in 1754, the Cree and Assiniboine at that time were using horses only as pack animals (Ewers 1955:16-18).

Therefore, the descriptions of the bison drives and other related observations of Mathew Cocking in 1772-73, Alexander Henry (the elder) in 1776, Peter Fidler in 1792-93, Duncan M'Gillivray in 1794, Alexander Henry (the younger) between 1799 and 1811, and others, were indeed close to the time of the pre-horse drives and give us descriptions of communal drive methods that were very close to, or identical with, the drives employed on the northern Plains in late prehistoric times.

"The Great Fall Hunt"

What has been described as the "Great Fall Hunt" by Dodge (1882:287) and Robinson (1879:135-167), and " . . . the great

buffalo hunting season," by Ewers (1955:128), most likely originated as a result of the seasonal hunts of the agricultural tribes along the eastern periphery of the Plains, the central Plains, and the Middle Missouri region.

The farming tribes carried out buffalo hunts in summer after the spring planting and another hunt in late fall into winter after the harvest. Referring to the Sauk, Fox, and Miami, Quimby (1960: 133-134) stated:

Sometime after the harvest (corn and wild rice) entire villages moved into the prairies and prairie transition zones for the winter buffalo hunt. This was a communal affair and the villages were deserted except for men and women too old to walk such a distance. Able-bodied men and women, as well as children, walked to the winter hunting grounds. The hunting party was kept together by guards in order to prevent unfair advantage of individuals or small groups.

On the middle Missouri the horticultural Mandan and Arikara also conducted buffalo hunts when the crops were in. Denig (1961:48), writing of the Arikara in the 1850's described the event:

In the commencement of winter the Rees leave their village in quest of buffalo, which seldom come near enough to admit to their being killed close to the cabins. In that case they encamp in skin lodges mostly below their village, though not often going more than fifteen to forty miles off. Here sometimes alone and sometimes in company with the Sioux they pass the winter in hunting, and return to their residence early in the spring bringing with them their hides in their raw state, besides as much meat as they can cure by drying. The hides are dressed into robes before the season for planting comes on, and the meat with their reserves of corn enable them to live tolerably well.

Dodge (1882:287-288), referring most likely to Cheyenne or Arapaho, described the "great fall hunt" which was made ". . . for the purpose of killing sufficient animals, not only to furnish dried meat for the next winter's supply. . . ," but other articles, and

robes for the trade. The favorite and most successful " . . . mode of killing large numbers is by 'the surround,' . . ." which Dodge (1882:576) stated: " . . . was peculiar to the Cheyennes and Arapahos."

On the northern Plains, the annual hunting activities of the Red River Metis in Manitoba gradually became known as the Great Fall Hunt (Robinson 1879:138-319). Many of these Metis, whose fathers had presumably taken up the pursuit of farming, much preferred the buffalo hunt. According to Hornaday (1889:487-488), the Metis had hunted out the region around Fort Garry so that in 1820, their first large organized buffalo hunt was carried out. Using 540 Red River carts to carry their supplies, they hunted the bison using surrounds and the chase on horseback, filling the carts with meat and returning to the settlements. By 1840, there were no bison within 250 miles of Pembina. That year the number of carts was 1,210 and the hunting party totalled 1,630 men, women, and children (Hornaday 1889:487-489).

In 1857, according to Hind (1971:179-180):

About the 15th of June they started for their summer hunt of the buffalo. There are now two distinct bands of buffalo hunters, one being those of Red River, the other of the White Horse Plains, on the Assiniboine. Formerly these bands were united, but, owing to a difference which sprung up between them, they now maintain a separate organisation, and proceed to different hunting grounds. The Red River hunters go to the Coteau de Missouri, and even as far as the Yellow Stone River; the White Horse Plains settlers generally hunt west of the Souris River, and between the branches of the Saskatchewan, but also over the same grounds as their Red River Brethern.

As the buffalo diminish and go farther away towards the Rocky Mountains, the half-breeds are compelled to travel much greater distances in search of them, and consume more time in the hunt.

Robinson (1879:138) stated:

The parties belonging to the summer hunt start about the beginning of June, and remain on the plains until the beginning of August. They then return to the settlements for a short time, for the purpose of trading the pemmican or dried meat, which forms the staple article of produce from the hunt. The autumn hunters start during the month of August, and remain on the prairie until the end of October, or early in November, when they usually return . . .

The great fall hunt may have been a reality among the Red River Metis, both in the size of the hunting parties, the number of bison killed, as well as to the season of the hunt. However, among the Assiniboine, Cree, Blackfoot, Gros Ventre, and other tribes primarily dependent on the bison for food and other necessities, all seasons were great hunting seasons.

Early proponents of the great fall hunting season were Audubon and Bachman (1851:49), on the Missouri in 1843, who stated that the Gros Ventres, Blackfoot, and Assiniboines resorted to the use of pounds mainly in October and November, because the hides were in best condition at that time and saleable, and the meat was preserved for the winter supply. Later, Wissler (1910:41) stated:

Buffalo bulls were regarded in the best condition at about June of our Calendar. The cows, on the other hand, were prime 'when the leaves began to fall,' this being, in recent times, the great hunting season.

The wealth of historical evidence points to the fact that both the meat and hides of the cows were preferred. The meat of cows was preferred during most seasons of the year except during the calving season, and buffalo robes were best obtained during November, December, and January. According to Schaeffer (1962:29):

The season of drive use was predominantly in the autumn. The animals were in the best condition then, the hides were heaviest for winter robes, and the weather sufficiently cool to permit processing of meat. In contrast, summer bison were leaner, and the hides thinner but still available for making lodge covers.

From historical research and his work with Blackfoot informants, most of whom had never seen a bison drive, Ewers (1955:124; 1968:161-168) concluded that the Blackfoot used the drives primarily in autumn to lay in their supply of meat for the winter.

Although Ewers (1955:121-168) presented a case for the Blackfoot use of bison drives "primarily" in the fall of the year, it could have only applied well into the post-horse period when the movements of the bison had become erratic due to the hide hunters, and the Indians could no longer depend on them to appear in their former favoured haunts at given seasons.

According to Ewers (1968:163):

. . . in historic time, after they obtained horses, the Blackfoot employed the Piskun primarily late in fall and early in winter . . .

In the Blackfoot country the severe winter period usually does not begin until the last week of December or early in January. The dated references to the use of drives in the early contemporary accounts of Cocking and Henry refers to its employment not later than December.

Furthermore, Ewers (1955:129; 164-165) said that winter use of bison drives meant in early winter or during the months of November and December.

However, Ewers (1955:165) admitted that most early writers considered the Blackfoot drives to have been employed in winter:

Blackfoot drives have been described by Henry (Henry and Thompson, 1897, pp. 576-577); Maximilian (1906, Vol. 23, p. 108); Bradley (1923, p. 256); Grinnell (1892, pp. 228-232); Wissler (1910, pp. 34-38); and Barrett (1922, pp. 22-27). These

writers considered the drive a winter method of buffalo hunting among the Blackfoot.

To this list should be added the name Weasel Tail, the one Blackfoot interviewed by Ewers (1968:166) who had participated in a drive, and in winter. Peter Fidler's Journal described the use of jumps and pounds in December of 1792 and as late as March of 1793 (MacGregor) 1966:68-85). Because the winter was mild, the Piegans and Bloods, who possessed many horses by that time, did much of their hunting by chasing the buffalo on horseback.

Grinnell (1962:234) noted that the Blackfoot pis'kuns were strengthened and repaired in early fall for winter use. Among the Gros Ventre, Cocking (1908:109-116) reported pound repairs being made throughout the fall, and that pounds were constructed in winter, when necessary, to take buffalo herds in a specific locality.

Using Cocking's (1908:107-116) fall and winter visit among the Gros Ventre in 1772-73 as an example of the fall - early winter hunt that ended in December, Ewers (1968:163) stated:

The dated references to the use of drives in the early contemporary accounts of Cocking and Henry refer to its employment no later than December. Cocking was told on December 6 that the season for pounding was already past.

However, the season of the Gros Ventre bison drives, which is the same for other northern Plains tribes using bison drives, is shown by the entries in Cocking's (1908:107-116) journal during the severe winter of 1772-73.

Sept. 24, 1772. Thursday. Others with Neheathaway [Cree]
Indians going easterly: all to trap Wolves, & pound Buffalo;
at present only eight tents.

Oct 20. Tuesday. We are preparing to proceed tomorrow, to be in readiness for pounding buffalo at an Archithinue [Gros Ventre] pound.

Oct. 21. Wednesday. We did not proceed as intended, Waiting to kill Buffalo which were seen in great droves this morning.

Oct. 22. Thursday. We proceeded to the Pound.

Oct. 23. Friday. Every person repairing the Beast pound . . . This pound was made by our Archithinue friends last spring, who had great success, many Skulls & Bones lying in the pound.

Oct. 25 to 26. Sunday to Monday. Snow at times: Natives employed trapping & endeavouring to drive Buffalo to the pound but without success. We are not so expert at pounding as the Archithinue Natives.

Nov. 5 to 10. Thursday to Tuesday. Snow: Natives can make nothing of the pound, so are obliged to kill the Buffalo with the Gun, & Bow & Arrows. They have caught a few Wolves & Foxes, but not the number they might: They are an indolent thoughtless set of beings, never looking beyond the time present.

Dec. 2. Wednesday. The Archithinue Natives repairing the pound, the repair we gave it on our arrival not being sufficient.

Dec. 4. Friday. The Archithinue Natives drove into the pound 3 male & one female Buffalo, & brought several considerable droves very near: They set off in the Evening; & drive the Cattle all night.

Dec. 6. Sunday. No success in pounding: the Strangers say the season is past.

Dec. 7 to 12. Monday. The Natives pounded a few Buffalo & presented to me my full share.

Jan. 9, 1773. Saturday. We proceeded, intending to go to a Beast pound.

Jan. 22. Friday. Snow. A Young man joined us from the Beast pound to the Eastward of us, where we intended to go: He says the buffalo are so scarce that the Indians are distressed for want of food; & therefore had unpitched intending to build a pound farther on to the Eastward, where Buffalo are said to be numerous.

Feb. 23. Tuesday. This morning the Indian arrived from those we intend to go to, with information that all the Natives were pitched further on, towards Waskesew-Wachee, intending to build a Beast-pound there: my Leader with eleven tents of Asinpoet

[Assiniboine] Natives unpitched intending to proceed there; but I with nine tents apart; Asinepoet Natives lay still: they intend to build Canoes at Saketow-Wachee. The Neheathaway Natives intend to go to the pound but slowly; endeavouring to preserve provision by pitching after the Buffalo; fearing a scarcity at the Beast-pound: with these I intend to go.

Feb. 27 to March 2. Saturday to Tuesday. Lay by: Hunters hath middling luck. Information from the Beast pound that they have also middling success.

Mar. 27. Saturday. We proceeded: Our course N.E. & distance 10 miles, through Woody hummocks, with some large Ponds: We arrived at the Beast pound, where we met with my Leader again, with 4 tents of Neheathway & 20 tents of Asinepoet Natives.

Mar. 28 to April 3. Frosts & thaws. Natives pounded several Buffalo: they bring droves to the pound, but only few enter into it.

Apr. 4. Sunday. Three Male Buffalo entered the pound.

Flannery's (1953:53) recent statements from Gros Ventre informants conflict with Cocking's account. According to Flannery (1953:53):

There are two regular peaks of intensive hunting--a concerted effort on the part of the tribe as a whole--in the spring and in the fall . . . During the dead of winter the hunting of buffalo was said to have been only sporadic and not on so large a scale.

However, Cocking's account indicates that the Gros Ventre hunted with the same intensity in winter as in fall, with about the same success.

According to Flannery's (1953:56-57) informants, the Gros Ventres had lots of horses and by 1850, they had abandoned the use of bison drives. Therefore, her statements from informants might apply to the season of Gros Ventre bison hunts in the latter part of the 19th century, but they bear slight relationship to the season of the much earlier bison drives in Cocking's time that

began in autuman and continued until the end of winter.

Other early references indicating the season of bison pound use have come from the journals of several Hudson's Bay Company men. William Tomison's journal (Johnson 1967:111 & 118) for Edmonton House, near present-day Edmonton, Alberta, under an entry for March 3, 1798, stated:

At half past 6 p.m. two more [Indians] arrived from a buffalo pound and brought nothing at all.

And on April 25, 1798, in a letter to George Sutherland:

. . . so it appears for all the Southerd Indians on the south side of the river was at two buffalo pounds until lately, thirty-two tents in number, and they have not brought a pound of provisions to either of the houses nor a skin of any kind.

On April 27th, he wrote in his journal:

At noon a band of Southerd Indians arrived . . . they have been lying at a buffalo pound all winter and neither have procured furs or provisions.

On April 8, 1799, Tomison (Johnson 1967:162), still at Edmonton House, noted in his journal:

At noon fifteen tents of Indians arrived on the other side from a buffalo pound where they have been most part of winter and have got thirty skins among the whole and not much provisions.

At Edmonton House in the year 1800, James Bird (Johnson 1967:235) recorded in his journal under entry of February 21st:

The men who went for meat yesterday arrived and tell us that twenty tents of Blackfeet have made a pound quite near the hunting tent and drove off every buffalo that our hunters are now quite at a loss where to go.

Among the Assiniboine, the earliest record of a bison drive is that of the elder Henry (1969:299-301), who was present at a drive into a pound in mid-February of 1776.

At Fort George, on the North Saskatchewan River in 1794, M'Gillivray (1929:38) noted on October 30, that an Assiniboine chief, " . . . reports vast herds of buffaloes are at the Paint [Vermilion] River where he intends to make a pound in the course of the winter." On January 19, 1795, M'Gillivray (1929:50 & 53) noted, " . . . the Grand River Assiniboine went off to their pound," and on February 9th, " . . . a Grand River Assiniboine Chief with 8 women arrived from their pound with about 500 lb. Pounded Meat."

Simpson (1843:402), who was at Carlton from January 13th to 15th, noted that near Carlton there were "Three camps of Assiniboine each with its own pound into which they drove 40 or 50 animals daily."

Rudolph Kurz (1937:145), at Fort Union, in 1851, stated:

During the winter season the Assiniboine and other tribes construct in the neighborhood of their villages so-called parks or enclosures, into which they entice buffaloes and kill them in droves in order to provision the settlement with meat for a long period.

On the Fort Belknap Reservation in Montana, an Assiniboine informant who said that he was present at a drive when he was a boy, told Rodnick (1938:25) that his band had pounded bison near "Woody Mountain" in the spring of the year.

Among the earliest references to Cree drives is that of M'Gillivray (1929:49), who, at Fort George on December 11, 1794, recorded that the Cree were driving buffalo into a pound.

Sir John Franklin (1970:109-113) was invited by the Cree to visit a pound they were using and he did so on February 6, 1820. Although no bison were driven into the pound during Franklin's short visit, the pound was clearly in use at that time.

During the mid-19th century, historical sources show that the Cree used bison pounds in summer as well as in fall and winter. According to Jefferson (1929:22), "Season mattered not; either summer or winter would do." On September 12, 1846, Paul Kane (1968:80) visited a pound near Carlton and observed Cree Indians driving bison into it.

The peak of the bison rutting season, which occurs from late July into mid-August, apparently had little effect on the success of drives by mounted Crees. According to Hind (1971:1:339), on July 25, 1857, he and his party received word that " . . . some thirty tents, was [sic] at the Sandy Hills impounding buffalo." On July 29th, or four days later, Hind (1971:1:354-357) reported that the Indians were constructing a new pound, because after ten days of pounding bison in the old one, the stench from rotting carcasses was so overpowering that they were forced to move.

The foregoing material is sufficient to demonstrate that the northern Plains tribes used the traditional jumps and pounds from late fall throughout the winter and also at other times of the year.

The supposition that the northern Plains tribes laid up enough dried provisions in autumn to supply themselves throughout the often severe winters while they remained inert in their camps relies essentially on the basic premise that the drives ended in December. Otherwise, why lay up great stores of meat during autumn?

The buffalo hunting tribes followed the bison throughout the year. As Henry (Henry & Thompson 1965:723) observed of the Piegans:

The buffalo regulate their movements over this vast extent of prairie throughout the year, as they must keep near these animals to obtain food.

The pounds and associated camps were always in areas where the bison wintered or were expected to winter. As pointed out by Ewers (1955:128):

. . . the number of camp moves was determined largely by the available supply of meat . . . if a band failed to come upon buffalo in sizeable herds, more frequent moves were necessary.

During the early contact period, the large number of bison that the elder Henry (1969:318) observed, prompted him to comment:

The amazing numbers of these animals prevent all fear of want; a fear which is incessantly present to the Indians of the north.

That the Indians were accustomed to having a continual supply of fresh buffalo is shown in Henry's (Henry & Thompson 1965:725) statement that the Piegans,

. . . are seldom out of food, for they keep a stock of dried provisions on hand for emergencies, as buffalo sometimes disappear, and it may be several days before they can get a fresh supply. When they are reduced to dried provisions they call it starving.

In the 1890's, from Blackfoot informants, Grinnell (1962: 234) noted that the Blackfoot were well provisioned in winter, stating:

. . . they always had plenty of buffalo--if not fresh meat, that which they had dried. For in winter they would kill large numbers of buffalo, and would prepare great stores of meat.

It is also apparent that before the year 1800, the northern Plains Indian bands were relatively independent of the posts and

forts. There were many dejected comments from the Hudson's Bay Company traders concerning their inability to induce the Indians to trap furs and provision the posts from surpluses at the pounds. For example, William Tomison (Johnson 1967:111 & 118) reported in his diary on March 3, 1798,

At noon the Indians went away, and four more came which went away also, and the whole did not bring above twenty made beaver . . . two more arrived from a buffalo pound and brought nothing at all.

In a letter dated January 6, 1799, to William Tomison, James Bird (Johnson 1967:186), at Edmonton House, complained:

I am sorry to inform you that we are utterly disappointed in our hopes that by building here we should be able to prevail with at least a part of the Indians to hunt the beaver; save the Bungees, all without exception are tenting in the plains, killing the buffalo for themselves to eat and catching a few wolves, they have not even hitherto made any dried provisions so that I am apprehensive that we shall not be able to procure the usual quantity . . .

M'Gillivray (1929:49) of the Northwest Company was put off, in December of 1794, because the Cree amused themselves driving buffalo into a pound, "a very unfavourable circumstance for our returns."

The undependability of the Indians to provision the posts encouraged the traders to hunt their own supplies of winter meat as well as to initiate early the common practice of hiring individual Indians and small parties for that specific purpose.

In terms of European values and thriftiness, the Plains Indians appeared as improvident profligates. Cocking (1908:110) considered the Indians that he met as " . . . an indolent thoughtless set of beings, never looking beyond the present time." Larocque

(1910:60) commented in 1805 that the Indians were most improvident with regard to provisions and within two or three days after a successful hunt the meat was gone. Fidler (MacGregor 1966:73) observed of the Blackfoot: "They brought us a little meat, about 8 or 10 Buffalo which in this part is not thought so much of as a Goose at Hudsons Bay." In February, 1793, Fidler (MacGregor 1966:81) noted in his journal: "The greater part of the Cows the Indians now kill is merely for nothing else but the calf."

In fairness to the Indians, they looked upon the bison as an inexhaustible resource, even in the latter days of free roaming herds.

The northern Plains Indians hunted the buffalo for themselves in winter, and if their success at the pounds was more than the immediate and foreseeable needs of the village required, this surplus was either used by themselves, or other members of the tribe, or was traded to the posts.

Some anthropologists, including Wissler (1921:5), and more recently, Oliver (1962:54) and Frison (1971:86), writing about the annual cycle of the Plains Indians, have expressed the view that in post-horse times, in autumn, after the rut, the bison dispersed for the winter, necessitating " . . . a basic pattern of fragmented bands in the winter months and concentrated tribal units in the summer months' (Frison 1971:86).

Here, concern is expressed over the notion that the Indians always split into small groups or families during the winter to more effectively exploit the assumed dispersed herds of bison.

From the historical examples of Fidler (MacGregor 1966:82), Steele (1915:87), and Grinnell (1904:143-146), as well as Soper (1941:380), Cahalane (1947:75), and Nelson (1965:22), the bison formed larger, sedentary herds in winter that favoured the grasses of sheltered coulees, woods, streams, and river valleys. Also, small herds were scattered over the range in sheltered wintering localities. In terms of herd size, therefore, small herds of bison as well as very large herds were predictable on the plains both in winter and in summer, and probably in spring and fall as well.

The premise that the Indians split into small groups during winter to better exploit a harsh and hostile environment has rested largely on the assumption that the bison drives ended in December. Thereafter, for the remainder of the winter, the Indians were supposed to be reduced to stalking game on foot or chasing the bison on horseback when the weather and the fitness of the horses permitted. The spirit of this premise, however, appears rooted in a statement by the younger Henry (Henry & Thompson 1965:2:723) with reference to the Piegans:

In summer they are obliged to assemble in large camps of from 100 to 200 tents, the better to defend themselves from enemies. In winter, when there is not so much danger, they disperse in small camps of 10 to 20 tents, make pounds for buffalo, and hunt wolves and kits.

The diaries of Hendry (1907), Cocking (1908), Fidler (MacGregor 1966), M'Gillivray (1929), Henry (Henry & Thompson 1965),

and others, relate the comings and goings of numerous small and large parties of Indians throughout the year. Moreover, some of these small groups in fall and winter did indeed operate or intend to operate pounds (Cocking 1908; MacGregor 1966:85). However, contrary to Henry's (Henry & Thompson 1965:723) statement of Piegan dispersal in winter, Fidler (MacGregor 1966:80), also with the Piegans who were pounding bison, reported in January of 1793:

The next day several more Piegans arrived and erected their tents. By now the Indians assembled made up a very large camp composed of one hundred and ninety tents of Piegans, thirteen of Blackfoot, twelve of Sarcees, and five of Plains Cree, while over two thousand horses grazed on the hillsides.

Assuming that the number of people per lodge was eight persons (Ewers 1955:139), within the 220 tents, approximately 1,760 people were encamped together in January. However, the weather was mild, and in addition to the meat secured from the jumps and pounds, there was the continual supply of fresh meat from the chase on horseback. There was no threat from enemies at the time, although some young pranksters falsely alarmed the camp with a rumor that several enemy Flathead Indians were seen in the vicinity.

On the other hand, the Assiniboine were noted for their large winter camps. In mid-February 1776, the elder Henry (1969:295) among the Assiniboine, who were pounding bison, noted:

Leaving our tent, we made a progress through the village, which consisted of about two hundred tents, each tent containing two to four families.

Earlier, while travelling to the Assiniboine village, Henry (1969:281) remarked that the tent in which he slept contained fourteen

persons, each of whom slept with his feet to the fire which was in the middle. However, assuming that the number of persons per lodge averaged only eight, approximately 1,600 people were camped together during a very cold winter. At this time, the Assiniboine had few horses and the meat from the pound " . . . was brought to the village on sledges drawn by dogs"(Henry 1969:301). In this case, there was no mention of danger from enemy tribes. Although trade was carried on with the Hudson's Bay Posts, Henry (1969:317) observed that the Assiniboine were less dependent on the posts for merchandise than the Crees and, "The wild ox [buffalo] alone supplies them with every thing which they are accustomed to want."

Other early travellers noted that the Assiniboine " . . . generally winter together in large camps . . . (McDonnell 1960:279)," and pound bison. Mackenzie (1960:334) observed that, "Two bands of Assiniboines of a hundred lodges each . . . passed the winter at the forks of the Little Mississouri [Missouri] . . . " The camp at the Assiniboine pound visited by DeSmet (1905:3:1027), " . . . contained about 300 lodges which represent 2,000 or 3,000 souls." However, the season of the year was not mentioned.

Regarding the Cree, Henry's (Henry & Thompson 1965:513) concern was for the fur trade when he stated: "They are generally found in large camps winter and summer, idle throughout the year. Buffalo is their only object."

Despite the fact that the Gros Ventre had horses, their pounds were used in winter (Cocking 1908). Peter Fidler's journal for Chesterfield House (Johnson 1967:307), on January 15, 1802,

recorded that "Three Fall [Gros Ventre] Indians came in with furs. They say that the whole nation is at three pounds . . ." Whatever the Gros Ventre population was at that time, earlier, Hendry (1907: 340) noted in his diary on October 17, 1754, that " . . . 322 tents of Archithinue Natives [Gros Ventre] unpitched and moved Westward." This number of lodges probably did not comprise the whole Gros Ventre tribe in Hendry's day. Despite the ravages of European diseases and inter-tribal warfare, if the whole Gros Ventre tribe was located at three pounds, these could logically be inferred to be large camps.

From these accounts, the large winter camps can best be accounted for by reiterating that the fortunes of the Indians were inexorably meshed with those of the buffalo and depended on the presence of sufficient herds to sustain them in groups, large or small, through all seasons.

Other support for the "fall hunt only" hypothesis has come from archaeologist, George Frison. Frison has put forward a case to demonstrate that specific bison kill sites in Wyoming and Montana were used only in the fall of the year. The hypothesis proposed by Frison (1970b:41) states that:

. . . communal bison procurement was part of a yearly pattern on the Northwestern Plains with the result that populations came together in the fall for a short period and fragmented the remainder of the year. This pattern persisted until historic times and the introduction of the horse. The horse brought changes in buffalo procurement methods that were as profound as the changes in butchering resulting from the introduction of steel knives and axes.

The earliest documents from the northwestern Plains demonstrate rather conclusively that the traditional drives were used throughout the winter. That this pattern extended into the

prehistoric and pre-horse past seems also conclusive for the tribes under discussion. First of all, since these were mostly horse poor tribes, the horse can hardly be credited with having any wrought any "profound" changes between the prehistoric patterns of bison driving and those of the early historic period, especially among the Assiniboine, North Blackfoot, and the Plains Cree. Furthermore, among these tribes, persistence in the use of bison drives well past the mid-19th century also supports this pattern as a winter tradition of antiquity. Secondly, the horse was a definite liability in the use of the traditional drives (Henry & Thompson 1965:520). This is borne out by the fact that only those tribes with few horses continued to use the traditional drive methods. The horse, which was much more suitable for the chase and the surround, apparently led to the abandonment of the traditional drives by those tribes that became wealthy in horses.

Frison has also sought support for his "fall hunt only" hypothesis in his bison population dynamics studies. Based on the butchered remains of many modern day bison of known age, Frison and Reher (Frison 1970b & 1973) established tooth eruption schedules and tooth wear patterns for maturing bison that have been applied to remains excavated from two archaeological sites.

However, application of these two techniques to bone remains (mandibles) from archaeological sites can give only relative ages of the animals. The preciseness of season and month in the dating of kill sites that Frison has extracted from the use of these techniques requires at the outset a very restricted period

of time for the rutting season and for the calving season. As discussed earlier in Chapter III, both historical and modern observations show that the effective breeding season of bison varies both as to onset and duration. Although the peak of the rut generally occurs in August, effective breeding in different herds may begin in early June (Halloran 1968:25-26; McHugh 1958:23) or as late as latter July (Catlin 1965:1:249; Nelson 1965:29), ending early in September or October. Therefore, the peak of the rut could occur at anytime over a period of at least two months. Frison (1973:77) states: "Most young bison are born within a period of a few weeks in the spring of the year." This requires an equally restricted period for the conception of the calves. Therefore, the variability on onset and duration of the rut over a period of four months or longer makes presumptuous any conclusion that the peak of the rut always occurs with faithful predictability year after year during the same few weeks in late July and early August.

Although it is difficult to fault any archaeologist for the size of a sample he obtains, both techniques used by Frison and Reher require a fairly large sample of mandibles from each site and each level in a site to establish discrete groupings within a population. However, the samples were relatively small in all age groups from both the Glenrock Buffalo Jump (Frison 1970b) and the Wardell Buffalo Trap (Frison 1973). The sample was exceedingly small for the calves in Group One, consisting of two mandibles from the Glenrock Site (Frison 1970b:52) and four mandibles from the Wardell site (Frison 1973:97). Furthermore, tooth eruption

schedules respond to individual differences in maturation rate. Differences in bison diet on different parts of their range must also be considered. At the conclusion of the Glenrock monograph (Frison 1970b:55), Reher states: "The fact that about 85% of the .5 year old calves and 40% to 65% of the 1.5, 2.5, and 3.5 year old animals were removed suggests that this area [the butchering area] was not far away . . ." If such was the case, then remains from the campsite might drastically alter the age determinations and consequently the seasonal limitation conclusion.

The other site for which a population study was conducted was the Wardell Buffalo Trap (Frison 1973:89-105). From three separate stratigraphic levels, each possibly representing more than one kill, and from an associated processing area, a total of 232 individuals were removed. Again it was found that about 70% of the projected juvenile population had been removed. Also, only 20% of the total site area was excavated. The questioned results on the specific month of the bison drives at the Glenrock site and the Wardell site have been extrapolated to include other drive sites, therefore, alluding to their use only in the fall as well. Frison and Reher appear to have erected a pyramid on its apex rather than its base.

Based on the factors of (1) the varying onset and length of the rut and of the calving season, (2) the individual differences in maturation, (3) seasonal variations in diet among different herds in a marginal plains area or ecotone, and (4) a small sample of mandibles from immature bison, the technique of dentition

wear for aging the mature animals makes very questionable the precise age groupings as well as the precise short season of fall bison drives that Frison and Reher are apparently attempting to establish.

Although I do not preclude the possibility of a primarily fall use of certain bison drives in specific regions of the northern Plains, the case presented by Frison and Reher is unconvincing. The possibility of a "fall hunt only" season at the Wardell site will require detailed ecological information on the marginal desert-steppe environment of the Green River Basin to help determine its carrying capacity for bison, their seasonal movements, and, therefore, the size of human population the area could support with a given technology. However, a stratified bison drive site like the Wardell site implies the presence of resident bison herds in the area to warrant the construction and periodic operation of a drive. In addition, if fall was the season of the drive, then by October (the peak of Frison's bison drive season), the bison would have been ensconced on their winter range where they would have remained throughout the winter. If so, why should the Indians who used the Wardell site restrict their bison driving activities to a few weeks in the fall? Why not remain in the region of this natural larder and exploit it throughout the winter?

It may well be that much of Wyoming stands apart as a unique desert-steppe environment compared to most other parts of the northern Plains. Accepting this, it is therefore possible that Frison may be correct in speculating that small family-sized

groups of Indians occupied the regions of his bison kill sites throughout the greater part of the year. However, Frison, as well as Oliver (1962:3), have postulated a dispersal of Indians into small bands in winter for all of the bison dependent hunting tribes of the northern Plains. As previously discussed, neither the evidence on bison behaviour nor the historical evidence on the size of Indian camps in winter supports any such contention. In fact, the very tribes that should have been reduced to family sized groups in winter because they lacked horses are the same tribes that are reported to have consistently wintered in large bands. Regarding the large size of these camps, it is very doubtful that fear of their neighbours with a few more horses would be worthy of consideration since the tribes discussed in this paper had few horses in the 1700's. The Assiniboine, for example, were apparently in no fear of equestrian enemies during the elder Henry's visit in February of 1776, and they had a reputation for wintering in large camps. Therefore, generalizing the results from one region or area of the Plains to another, and specifically with regard to Indians in a given environment, may often lead to considerable differences of opinion among investigators based on the results of their own work.

CHAPTER VI

CONCLUSIONS

This study has had three aims, which are interrelated. First, a major aim has been to clarify certain relationships between the annual cycle of the northern Plains Indians and the annual cycle of the American bison. This clarification has been for the use of Plains anthropologists in constructing hypotheses and models that will eventually lead to more fruitful explanations and more accurate reconstructions of Plains Indian life in the past.

Contrary to the view expressed by Wedel (1961:242), " . . . that the life of Plains Indians is so well known that it requires only brief mention," this study hopefully buries that notion, and rather, begins to reveal the complex interplay of Plains Indian cultural adaptations to the wide range of ecological variables that comprise the concept of Plains.

Somewhat surprising is the fact that no studies of bison behaviour from the literature have been pulled together and written by Plains anthropologists--those most directly affected by this important information. Virtually the only documentation on bison behaviour available among archaeologists is the historical material on the

subject by Wheat (1972:86-91).

Another good example of an important and ignored ecological factor has been the use of fire by Indians. Obviously, the stereotyped conceptualization of the northern Plains Indian buffalo hunter has not included knowledgeability of the use of fire. This study has demonstrated that in combination with other ecological factors, northern Plains Indians were adept in using fire for bison herd management during drives, as well as its seasonal use in larger geographical contexts.

A third aim has been to encourage analysis of environmental factors in relationship to one another and to human behaviour, in an attempt to shift away from descriptive history. Certainly, this study may be considered historical in its approach. However, it hopefully has gone beyond the descriptive level and into certain interrelationships of the ecological factors that have been examined in this study. Obviously, Plains anthropologists must become very knowledgeable about the bison and its interaction with the grassland, fire, and other significant ecological variables, if explanatory, causal, relationships with Plains Indian tribal technology, social organization, and ideology are to be realized in Great Plains anthropological research.

An application of the findings of this study to Plains archaeology is to Frison's (1970b:41) hypothesis, which, if true, is restricted to less advantaged and very arid regions of the Plains.

Turning to the hypothesis and the specific questions raised to test it that were outlined in the introduction to the study.

The hypothesis states:

The annual cycle of the bison dependent northern Plains tribes as reconstructed and described by Ewers (1955), Oliver (1962), and Frison (1967, 1970b, 1971, 1973), among others, and which is accepted by Plains anthropologists, does not coincide with early historical, documented evidence of Indian behaviour and bison behaviour, nor with modern evidence on bison behaviour and other ecological variables.

The questions are given as statements of the findings of the study.

1. Among the northern Plains tribes, dependent year round on the bison, the season of bison drive (jumps and pounds) use began in the fall of the year and continued throughout the winter.

Furthermore, the early historical accounts indicate that throughout the drive season, the use of the drives continued with about the same intensity.

2. The northern Plains tribes stored up dried provisions throughout the winter for use when supplies of fresh meat were gone. However, the bison drives were used throughout the winter and the production of large quantities of dried provisions in early fall for winter use was not undertaken and was not necessary in early historic times.

3. In early fall, after the rutting season, the bison moved onto their winter range where they tended to form larger, more sedentary herds and aggregate herds, thereby permitting the formation of large Indian encampments in the vicinity of these large herds which were exploited by the use of traditional bison drive methods throughout the fall and winter.

The horse became increasingly important in hunting among

the Piegan, Blood, and Gros Ventre. However, the horse can hardly be considered an important reason for the existence of the early large encampments when we consider that for the horse poor Cree and Assiniboine, there is substantial documentation that they always wintered in large camps. Therefore, minimization of the horse as a factor permitting large encampments strongly suggests that the primary factor was the presence of extensive bison herds. If so, the practice of large winter encampments could extend far into pre-horse antiquity.

In conclusion, this study demonstrates that the annual cycle of the northern Plains tribes was patterned and predictable within the larger context of a slowly changing Plains environment. The internal dynamics of these cultures is reflected in the continual adaptive response to the seasonally changing environmental variables. However, the introduction to the Plains condition of new variables, such as the horse, gun, and European goods, values, and domination, did, as Oliver (1962:68) says, trigger " . . . a whole series of cultural modifications." More significant, however, has been the overwhelming and rapid change that took place until the bison were gone. This change has so clouded our conceptions of the early historic Indians and the pre-horse environment that our current reconstructions reflect real Plains Indian cultures in the same degree as a good western movie.

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1974

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This report contains brief summaries of the archaeological salvage projects undertaken by the Salvage Section, Archaeological Survey of Canada, in the summer of 1972.

- No. 16 "Faunal Remains from the Nodwell Site (BcHi-3) and from Four Other Sites in Bruce County, Ontario" by Frances L. Stewart. 149 p., 7 figures. \$2.00

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Minor excavations and surface collections are described. This report focusses on material of the second millennium A.D. and the concurrent question of local variation.

- No. 21 "Archaeological Survey of Canada: Annual Review 1973" edited by George F. MacDonald. 51 p., on request.

- No. 22 "The Nodwell Site" by J.V. Wright. 335 p., 51 tables, 21 figures, 9 charts, 22 plates. \$4.00

The Nodwell Site is a mid 14th century ancestral Huron-Petun village site that was almost completely excavated in 1971 by a joint National Museum of Man and Royal Ontario Museum expedition.

- No. 23 "The Belly River: Prehistoric Population Dynamics in a Northwestern Plains Transitional Zone" by J. Michael Quigg. 165 p., 26 photographs. \$2.00

This report summarizes the archaeological salvage investigations undertaken along the Belly River in southwestern Alberta. In the course of the project numerous archaeological sites were located eroding into the river, and some of the more important localities were excavated.

- No. 24 "Crowsnest Pass Archaeological Project 1973 Salvage Excavations and Survey Paper No. 2 Preliminary Report" by B.O.K. Reeves. 95 p., 6 plates, 8 photographs. \$1.25

This report constitutes a statement on the progress of archaeological salvage operations at a number of important archaeological sites situated in the vicinity of Crowsnest Lake in southwestern Alberta. These sites, endangered by highway construction, have provided important information about the 8000 year occupation history of this region.

- No. 25 "The McCluskey Site" by K.C.A. Dawson. 116 p., 5 figures, 20 tables, 4 plates. \$2.00

A detailed description of a Blackduck tradition site which also contained Laurel tradition and transitional materials. The major occupation is assigned to the Western Area Algonkian culture of northwestern Ontario.

- No. 26 "Archaeological Salvage Projects 1973" compiled by W.J. Byrne. 182 p., 2 plates, 14 maps, 24 photographs. \$2.50

In 1973 the Salvage Section, Archaeological Survey of Canada, National Museum of Man, instituted 31 archaeological salvage projects across the country. This report contains summary articles dealing with 29 of the 31 projects.

1975

- No. 27 "Archaeological Reconnaissance in Northern Interior District of Mackenzie: 1969, 1970 and 1972" by Donald W. Clark. 405 p., 16 plates, 13 tables, 20 figures. \$4.25

Approximately 75 prehistoric sites and nearly 50 historic or recent camps are reported for the areas north and west of Great Bear Lake. Collections are small and in most cases superficial, but groupings and periodization are attempted.

- No. 28 "Of Men and Herds in Barrenland Prehistory" by Bryan H.C. Gordon. 564 p., 1 map, 20 figures, 48 tables, 38 plates. \$5.75

This study attempts to elucidate the temporal and spatial interrelationships between the barrenland Pre-Dorset peoples, climates and caribou herds in the period 1500 - 700 B.C. Items such as discreteness of herds and human bands, band movements and communication and differing cultural patterns as evidenced in artifacts, are discussed. All are used in the formulation of the discrete band/discrete herd relationship.

- No. 29 "The Prehistory of Lake Athabasca: An Initial Statement" by J.V. Wright. 193 p., 22 tables, 6 figures, 19 plates. \$2.50

The position of Lake Athabasca relative to the Plains, Boreal Forest, and Arctic physiographic zones, which have changed through time in response to climatic fluctuations, has resulted in cultures adapted to these three zones occupying areas of the lake during certain periods. During the later prehistory the western half of the lake was exploited by a Plains-derived, bison hunting culture whereas the eastern half of the lake was exploited by a Boreal Forest-derived, caribou hunting culture.

- No. 30 "Skeletal Variability in British Columbia Coastal Populations. A Descriptive and Comparative Assessment of Cranial Morphology" by Jerome S. Cybulski. 328 p., 68 tables, 13 figures. \$3.75

Metric and non-metric techniques of analysis are used to study the interrelationships of the Haida, Kwakiutl, Nootka, and Coast Salish ethnic divisions of British Columbia. Both between and within group variation is considered based on crania in museum collections.

- No. 31 "Archaeological Survey of Canada:
Annual Review 1974" edited by George F.
MacDonald. 72 p., 16 photographs;
on request.

- No. 32 "Prehistory of Saglek Bay, Labrador:
Archaic and Palaeo-Eskimo Occupations"
by J.A. Tuck. 265 p., 8 figures, 27
plates. \$2.75

Description of Maritime Archaic, early Palaeo-Eskimo, and Dorset Eskimo occupations of Saglek Bay in northern Labrador with comment on settlement - subsistence, culture history, and possible prehistoric Indian and Eskimo contacts.

- No. 33 "Salvage Contributions: Prairie
Provinces" edited by R. Wilmeth.
212 p., 12 figures, 17 plates. \$3.00

The six archaeological reports in this issue pertain to salvage operations carried out under contract with the Archaeological Survey of Canada, National Museum of Man. Three of the projects were located in southern Alberta, one each in northern and southern Saskatchewan, and one in southern Manitoba.

- No. 34 "An Archaic Sequence from the Strait of
Belle Isle, Labrador" by Robert McGhee
and James A. Tuck. 263 p., 6 tables,
3 figures, 28 plates, 2 appendices.
\$3.25

The evidence is presented for man's continuous occupation of the Strait of Belle Isle region of Labrador from approximately 8,000 - 9,000 years ago until 3,000 - 2,000 years ago when the local Maritime Archaic tradition was interrupted by a possible environmental change and the appearance of Dorset Eskimos.

- No. 35 "Koniag-Pacific Eskimo Bibliography" by
Donald W. Clark. 105 p. \$1.50

This anthropological bibliography of the Pacific Eskimo area of Alaska also features an extended historical coverage for Kodiak and adjacent Islands. Many of the nearly 500 entries are annotated.

- No. 36 "Archaeological Salvage Projects 1974"
 compiled by Roscoe Wilmeth. 102 p.,
 29 figures, 3 tables. \$1.25

In 1974, the Salvage Section, Archaeological Survey of Canada, National Museum of Man, instituted nine archaeological salvage projects across the country. These ranged from a brief survey of one portion of the Mackenzie Highway to the extensive survey and excavations on the Suffield Military Reserve in southeastern Alberta. This volume contains summary articles describing these projects.

- No. 37 "An Introduction to the Ecology of
 Early Historic Communal Bison Hunting
 Among the Northern Plains Indians" by
 George W. Arthur. 156 p., 1 figure.
 \$2.00

This study uses archaeological, ethnohistorical and ecological data in an effort to understand the nature of early historic communal bison hunting among the northern Plains Indians.